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ABSTRACT BOOK

WORLD CONFERENCE ON LUNG HEALTH 2025 OF THE INTERNATIONAL UNION AGAINST TUBERCULOSIS AND LUNG DISEASE (THE UNION)

COPENHAGEN, DENMARK
18 – 21 NOVEMBER 2025

The Research Institute of Tuberculosis,
Japan Anti-Tuberculosis Association

Since its foundation in 1939, the mission of the Research Institute of Tuberculosis, Japan Anti-Tuberculosis Association (RIT/JATA) has been to contribute to domestic and global tuberculosis control by conducting various studies in broad fields, including basic science to clinical/epidemiological studies, providing technical support for national and local governments, public health centres, and medical facilities, as well as performing activities for international cooperation and collaboration.

Our Vision

A world where no one suffers from tuberculosis

Our Mission

Our mission is to eliminate TB suffering through the development and implementation of comprehensive TB control strategies.

Find us online at: https://jata.or.jp/english/

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56th World Conference on Lung Health of the International Union Against Tuberculosis and Lung Disease (The Union) Copenhagen, Denmark, 18 – 21 November 2025

SYMPOSIA

SY01-110-01 The Lancet Global Health Commission on medical oxygen security

Chair: Rebecca Nantanda, Makerere University Lung Institute, College of Health Sciences Makerere University, Kampala, Uganda
Chair: Carina King, Karolinska Institutet, Stockholm, Sweden

The Lancet Global Health Commission on Medical Oxygen Security was published in February 2025 with the first estimates of the number of patients needing medical oxygen by region and type of need (acute, surgical, long-term, and COVID), and the quantities needed. The report also estimated the size of the access gaps for pulse oximetry and medical oxygen and the cost of filling the gaps by region. The Commission produced new tools for governments and global health agencies, including 10 oxygen coverage indicators, a scorecard to measure national progress, 20 areas for innovation, and priorities for future research. The Commission's 52 recommendations call for measurable actions for specific stakeholders.
This session will communicate the findings of the Commission and engage the audience the implementation of the recommendations to save lives now and prepare for the next pandemic.

The Lancet Global Health Commission on Medical Oxygen Security: Findings and recommendations

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The presentation will address the major findings and recommendations from the Lancet Global Health Oxygen Commission, and describe the new tools developed to help health facilities, governments, and global health agencies measure progress to universal access to pulse oximetry and medical oxygen. These tools include oxygen coverage indicators, a national scorecard, and priority areas for oxygen innovation and research.
The presentation will engage the audience in the specific actions required to implement the Commission's recommendations and how they can contribute to transforming access to oxygen - a neglected area of lung health affecting many infectious and chronic respiratory conditions.

The vital role of pulse oximetry as the gateway to safe, effective, and appropriate medical oxygen services

E McCollum,[1] [1]Johns Hopkins University School of Medicine, Baltimore, United States.
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The presentation will provide a thorough exploration of the findings and recommendations of the Lancet Global Health Oxygen Commission relating to pulse oximetry. The Commission found that pulse oximetry was done in only 19% of people presenting to general hospitals in LMICs, and almost never done at primary health-care facilities, and that this lack of access was the fundamental barrier to safe, effective, and appropriate medical oxygen services.
The presentation will also discuss other critical issues, including the accuracy of pulse oximeters on darker skin tones and in infants and young children.

Long-term oxygen therapy for people with chronic needs: Addressing a neglected and rapidly growing population

N Navuluri,[1] [1]Duke University School of Medicine, Durham, United States.
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The large and growing number of individuals needing long-term oxygen therapy to manage chronic lung conditions will continue to place great demands on health systems, especially those in low- and middle-income countries (LMICs). Lack of data, especially from LMICs,

hampered efforts by the Lancet Global Health Commission to examine barriers to oxygen access for this group and recommend remedial action.
This presentation will describe the Commission's findings with respect to patients needing long-term oxygen therapy and discuss emerging research to better understand how to meet the long-term oxygen needs of patients with chronic conditions.

Oxygen for essential emergency and critical care, including during pandemics and other health emergencies

T Baker,[1] [1]Muhimbili University of Health and Allied Sciences, Dar es Salaam, Tanzania.
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The massive need for medical oxygen to treat critically ill patients and for surgery was documented by the Lancet Global Health Oxygen Commission alongside large gaps in access in low-resource settings; gaps which grew exponentially during COVID-19 and led to many health systems running out of oxygen.
This presentation will explore current trends in essential emergency and critical care and how oxygen access be guaranteed in low-resource health facilities. Recent research from The African Critical Illness Outcomes Study (ACIOS): a point prevalence study of critical illness in 22 nations in Africa, will also be presented.

Closing pulse oximetry and medical oxygen access gaps across Africa: What will it take?

R Nantanda,[1] [1]Makerere University Lung Institute, College of Health Sciences Makerere University, Kampala, Uganda.
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The Lancet Global Health Oxygen Commission highlighted the widest gaps in access to pulse oximetry and medical oxygen across Africa,with nine in every ten patients needing oxygen for acute care unable to access it.
This presentation will explore the specific barriers to pulse oximetry and oxygen coverage across the continent and discuss strategies to close the gaps. Emerging research on the burden of conditions requiring oxygen among children and adults in Africa will be discussed.

SY02-120-02 Expanding access to molecular testing for TB: Evidence, scope, and impact of specimen pooling strategies

Chair: Jacob Creswell, Stop TB, Geneva, Switzerland
Chair: Mohammed Yassin, Global Fund to fight AIDS, Tuberculosis and Malaria, Geneva, Switzerland

In 2023, less than half of people with TB received an initial rapid molecular diagnostic (RMD) test. Specimen pooling can expand access to RMD, combating high costs, supply limitations, and funding constraints. With TB and infectious diseases expertise, pooling is set for WHO guidelines evaluation. This symposium highlights innovative use of specimen pooling in TB diagnosis, particularly focusing on experiences from Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Vietnam. Presentations will cover a range of insights from the operational feasibility and acceptability of pooling sputum samples, to the experiences and outcomes of implementing these strategies in programmatic settings.
Two presentations will share the latest evidence on accuracy of pooling from a large implementation study and from a systematic review. The discussions will also navigate the potential risks, future opportunities, and necessary considerations for scaling up pooling in TB diagnostics worldwide.

Increasing access to rapid molecular detection of TB with pooled testing of specimens from multiple individuals in Cameroon

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In Cameroon, pooled testing has been used as a strategy to increase access to rapid molecular diagnostics since 2020. Specimens from more than 80,000 people have been tested using this approach, as part of TB REACH activities and also in routine testing. Approximately twice as many people have been able to access a rapid molecular test with pooled testing as compared to individual testing.
We will describe results to date, as well as the perspectives of laboratory personnel, clinicians, and decision makers on the use of pooled testing for TB in this setting.

Evaluating the feasibility and acceptability of pooled testing for TB screening: A qualitative study across seven high-burden, low- and middle-income countries

V Iem,[1] [1]Liverpool School of Tropical Medicine, Liverpool, United Kingdom.
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Pooled testing, where multiple samples are combined and tested with a single test, was explored across seven high-TB burden countries to assess its acceptability and feasibility for TB screening. Data were collected through key informant interviews and focus group discussions with healthcare workers, people with TB, and stakeholders. Participants expressed mixed views.
While some saw pooling as cost-effective and practical in resource-limited settings, others raised concerns about operational complexity, accuracy, and delays. Feasibility depended on training, infrastructure, and workflow alignment. Acceptability was influenced by clarity of procedures and confidence in results. With proper support, pooled testing could enhance TB screening.

Testing more for less: evidence on pooling specimens for molecular testing at healthcare facilities and by active case finding in communities across seven high-burden countries

T Garg,[1] [1]Stop TB Partnership, Geneva, Switzerland.
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Specimen pooling can expand access to rapid, molecular diagnostics and overcome persistent challenges posed by high costs and supply-chain limitations.
We present results from the Start4All study which recruited individuals at primary and secondary level facilities, and through active case finding (ACF) in Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Vietnam.

Mass testing, smarter strategies: The case for sputum pooling for TB prevention and care among vulnerable populations

B Duarte,[1] [1]Institute of Research in Priority Populations (IRPP), Salvador, Brazil.
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This presentation explores the potential of pooled sputum testing as a cost-effective and scalable strategy for tuberculosis (TB) diagnosis in vulnerable populations. We present the results of a systematic review and meta-analysis evaluating the diagnostic accuracy, efficiency, and limitations of pooling strategies.
In parallel, we share findings from a real-world mass screening initiative conducted in a high-burden, underserved setting of Brazil. By combining global evidence with field experience, this talk highlights the feasibility and impact of pooled testing in resource-limited contexts, offering practical insights into implementation and policy development for more equitable TB control.

SY03-130-03 The urgent need for pragmatic clinical trials for new TB regimens: Considerations for design and conduct

Chair: Christian Lienhardt, French Institute for Research on Sustainable Development (IRD), Montpellier, France
Chair: Gavin Churchyard, The Aurum Institute, Isando, South Africa

Pragmatic trials bridge the gap between controlled clinical trials and real-world application. These trials assess how regimens proven efficacious in highly controlled, explanatory settings perform in diverse clinical environments, while retaining randomization as the gold standard tool for evidence generation. By evaluating the relevance and scalability of these regimens (or variations thereof) across diverse settings and populations, pragmatic trials play a major role in informing strong recommendations in international and national guidelines and drive broader adoption.
The objective of this session is to establish the rationale for pragmatic TB trials, explore practical considerations for their design and execution, and present case studies of ongoing and planned trials.
Join us to discover how pragmatic trials are transforming TB treatment and shaping the future of global health!

Pragmatic trials and streamlined trials: What are they and why do we need them in TB?

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Pragmatic, streamlined trials have demonstrated their value in generating large-scale, high-quality evidence rapidly and at relatively low cost in the context of COVID-19 and other diseases. In this session, Dr. Schumacher will outline the defining features of this trial approach and explain its strong potential for evaluating both existing and novel tuberculosis treatments. He will also examine the limitations of the current evidence base supporting TB treatment guidelines and discuss how pragmatic trials—aligned with recently released WHO 'Guidance on evidence generation'—can support more robust and actionable global recommendations.

Maximising both internal *and* external validity: Practical design considerations for pragmatic TB trials

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There is a false perception that clinical trials with high internal validity must sacrifice generalizability (external validity) and operational research studies that prioritize pragmatic generalizability necessarily lack rigor.
In this talk, Dr. Phillips will talk about design and conduct considerations for pragmatic TB trials that maximize both internal and external validity, presenting options and highlighting advantages and limitations. Dr. Phillips will use the PRECIS-2 tool as a framework for discussion.

A pragmatic trial of high-dose rifampicin in India

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In this talk, Dr. Narendran will present the pragmatic trial for high-dose rifampicin regimens for the treatment of TB that will be conducted in India. Dr. Narendran will present data on relevant results from recent high-dose rifampicin trials in India and worldwide, describing the rationale and key design and conduct aspects for the forthcoming trial.

The 4MOR trial: Evaluating HPMZ in a pragmatic cluster-randomised trial

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In this talk, Dr Wasserman will present the pragmatic cluster-randomized trial for a four-month rifapentine-moxifloxacin regimen for the treatment of TB (4MOR) that will be conducted in South Africa and Zimbabwe.
Dr. Wasserman will present relevant recent data, describe the rationale and key design and conduct aspects for the forthcoming hybrid effectiveness-implementation trial.

Panel discussion on pragmatic TB trials: Charting the way forward

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We will finish the session with a panel discussion including chairs, speakers, and experts from the field. The panel will add additional perspectives on pragmatic TB trials, commenting on the future and taking questions from the floor.
Additional experts include Oxana Rucsineanu, co-chair of the Global TB CAB; Dr. Francesca Conradie, a pragmatic trialist from the University of Witwatersrand; Dr. Sean Wasserman who is leading a pragmatic trial to be conducted across four countries; and Dr. Wenhong Zhang who runs a pragmatic clinical trials platform for TB treatment in China.

SY04-140-04 Innovative financing for TB programmes: Maximising resources in line with ambitious targets

Chair: Lucica Ditiu, Stop TB Partnership, Switzerland
Chair: Yogan Pillay, Gates Foundation, South Africa

In light of the sharp decline in traditional Development Assistance for Health (DAH), this session will explore the options for generating sufficient financing for TB prevention and care, consistent with eliminating TB at country level while increasing national self-reliance and resilience. It will explore prospects for increasing domestic funding and the roles to be played by Multilateral Development Banks (MDB), the Global Fund, private or corporate philanthropy, and innovative debt-for-health arrangements. Speakers will draw on recent experiences in Nigeria, Indonesia, India and other countries to explore lessons and identify practical opportunities for innovative financing models.

The Global Fund perspective on sustaining financing for TB elimination at the country level

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Faced with the prospect of severely constrained resources in GC8, how will the Global Fund leverage its budgets to maximize available funding for TB in high-burden countries?
The presentation will outline changes to the Global Fund's policies and practices with respect to matching funds requirements, eligibility transition, innovative financing approaches, and partnership with private philanthropy and multilateral development banks.

The role of multilateral development banks in financing for TB elimination at the country level

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In recent years, based on demand from client countries, most Multilateral Development Banks have tended to focus on system-wide health investments. This presentation will discuss the challenges and opportunities for leveraging such investments to drive TB-specific outcomes. It will also discuss lessons learned from recent TB-specific operations by the World Bank in Southern Africa, India and Indonesia, and the prospects for further such investments in high-burden countries facing a reduction in offi-

cial TB grants. The presentation will discuss opportunities for innovative financing, including buy-downs to enable high burden TB countries to implement high impact interventions at scale.

The potential role of debt-for-health transactions in financing for TB elimination at the country level

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This presentation will review the experience, strengths and limitations of traditional bilateral debt-for-health transactions for TB. It will describe the key features of the new generation of "trilateral" debt swaps on commercial claims, which generated close to US$ 1 billion of funding mainly for nature conservation in the last quarter of 2024 alone, and discuss the challenges and opportunities for TB programs to possibly benefit from this new mechanism.

The role of private and corporate philanthropy and investments in financing for TB elimination at the country level

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This presentation will discuss opportunities and challenges in raising funds for TB programs from domestic corporate and private philanthropic sources. It will review progress and lessons learned in Nigeria, where in July 2024 private sector partners pledged to raise $25m for TB as a match to the Federal Ministry of Health, and place this experience in the context of similar efforts in South Africa, India and elsewhere. It will assess the scope and the constraints to emerging innovative models of private financing.

Lessons from Indonesia's experience with mobilisation of domestic resources for TB

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Governments of TB High-Burden Countries are responding to cuts in international funding for TB programs by mobilizing increased domestic resources in the context of their own fiscal constraints. TB is among the top health priorities of the Government of Indonesia.
This presentation will review lessons from Indonesia's experience in mobilizing increased budgets for TB, including from sub-national governments, social health insurance, debt swaps and the private sector.

SY05-150-05 Drug-drug interactions in TB management: What every clinician should know

Chair: David Burger, RadboudUMC, Nijmegen, The Netherlands, Nijmegen, Netherlands

Management of drug-drug interactions (DDIs) in patients with tuberculosis (TB) is an important aspect of the clinical management of these patients worldwide. Rifampicin is without doubt the agent that causes most DDIs with a variety of co-administered agents, but for instance isoniazid and bedaquiline are also not without DDI issues.
Clinical decision support systems generate many DDI signals, but it is difficult for clinicians to judge which signals are clinically relevant, resulting in 'alert fatigue'. In some settings, clinical decision support systems may not be present and clinicians rely on publicly available (on-line) sources of DDI information. Many DDI sources are generic and not specifically built for TB patients, and not always take into account the complexity of TB treatment.
In this Symposium, we aim to give clinicians and pharmacists more guidance to optimize DDI management in patients with TB.

INSTI-based cART + HRZE for people with TB/HIV infection: New data changing policy

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The presentation on INSTI-based combination antiretroviral therapy (cART) in TB/HIV-infected patients highlights the efficacy and safety of integrase strand transfer inhibitors (INSTIs) in managing co-infection. It discusses the challenges of treating patients with both tuberculosis (TB) and HIV, including drug interactions and the impact on treatment adherence.
The presentation presents clinical trial data demonstrating that INSTI-based regimens can achieve viral suppression while minimizing adverse effects. Additionally, it emphasizes the importance of early diagnosis and integrated care approaches to improve patient outcomes in this vulnerable population, advocating for further research to optimize treatment strategies.

QTc-interval prolongation in people on bedaquiline and other TB drugs: A perfect storm or a tempest in a teacup?

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The introduction of novel and repurposed anti-tuberculosis (TB) drugs, including bedaquiline, delamanid, and fluoroquinolones, raised significant concerns about QTc interval prolongation and the risk of life-threatening arrhythmias. A 2018 critical review concluded that the risk of inadequately managed drug-resistant TB (DR-TB) far outweighed the risk of arrhythmias.
This pioneering study established the clinical relevance of QTc prolongation, identified key risk factors, and proposed mitigation strategies. Subsequent research has reinforced these findings, leading to the use of three QTc-prolonging drugs in the current DR-TB standard of care. While severe cardiac events remain rare, careful assessment is essential for certain high-risk patients.

TB and diabetes mellitus: Drug-drug interactions in two colliding epidemics

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The presentation on tuberculosis (TB) and diabetes mellitus explores the complex interplay between these two epidemics and their drug-drug interactions. It highlights how diabetes can exacerbate TB outcomes, complicating treatment regimens. The discussion includes the pharmacokinetic and pharmacodynamic interactions between antidiabetic medications and anti-TB drugs, which may affect efficacy and safety.
The presentation emphasizes the need for careful monitoring and individualized treatment plans to manage both conditions effectively. It advocates for integrated healthcare strategies that address the dual burden of TB and diabetes, aiming to improve patient adherence and overall health outcomes in affected populations.

Depression and TB: Double trouble?

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Depression and tuberculosis (TB) create a complex health challenge, often referred to as a "syndemic" due to their synergistic effects. Depression is prevalent among TB patients, exacerbating morbidity, mortality, and drug resistance, while also increasing the risk of TB reactivation and transmission. The bidirectional relationship between these conditions is influenced by biological factors such as immune response dysregulation and psychosocial factors like stigma and treatment non-adherence.
Addressing this syndemic requires integrated care approaches that combine mental health and TB treatment to improve patient outcomes and support global TB elimination efforts.

SY06-160-06 Progress towards a PAN-TB regimen: Insights from the PAN-TB collaboration's XBQS phase 2b/c Trial

Chair: David Holtzman, Gates Medical Research Institute, Cambridge, United States
Chair: Morounfolu Olugbosi, TB Alliance, Sandton, South Africa

New treatment options are urgently needed to simplify treatments for people with TB and health systems delivering their care. The PAN-TB Collaboration focuses on developing new, shorter regimens that treat drug-sensitive and drug-resistant TB (pan-TB). The PAN-TB trial is a two-stage, Phase 2b/c randomized controlled trial launched in July 2023 evaluating bedaquiline, quabodepistat, and sutezolid with delamanid or pretomanid. The trial introduced important innovations:
Staged design to assess treatment-shortening potential in a stepwise manner
Incorporation of typical Phase 3 endpoints (unfavorable outcome and durable cure utilizing whole genome sequencing) into Phase 2
A person-centered approach to TB care
Evaluation of multiple exploratory lab-based and clinical biomarkers
The symposium's overall objective is to contribute to the TB regimen development community's efforts to develop new TB drugs and regimens by presenting the final PAN-TB trial results and key learnings from the innovations implemented. Trial data will be available by Q3-2025.

When things don't PAN out: Results from the PAN-TB randomised controlled, treatment-shortening clinical trial

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The PAN-TB trial evaluated two investigational regimens (bedaquiline, quabodepistat, and sutezolid with delamanid [DBQS] or pretomanid [PBQS]) for their treatment-shortening potential. The trial's two-stage design planned to evaluate treatment durations of 4 months in Stage 1 followed by further reduction to 2-4 months in Stage 2. The trial was stopped early after enrolling 73% of Stage 1 participants based on insufficient efficacy observed in DBQS and PBQS arms to achieve the target regimen duration of =3 months.
This presentation will report final efficacy and safety outcomes from the trial, including end-of-treatment and 12-month unfavorable outcomes and sputum culture conversion.

Use and impact of whole genome sequencing to determine outcomes in the PAN-TB trial

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Use of whole genome sequencing (WGS) to classify post-treatment Mtb strains as same or different from baseline is a rapidly evolving field that has more recently been adopted in assessing outcomes of TB treatment trials. WGS was used in the PAN-TB trial to assess end-of-treatment and 12-month unfavorable outcomes by categorizing microbiologic failures as relapses or re-infections.
This presentation will report on the WGS classification of relapse or re-infection for participants with =1 Mtb-positive sputum culture(s) at 4 months of treatment or later in all arms and a description of evolution of intra-participant strains during and after cessation of treatment.

Implementing a person-centered approach to TB care in the PAN-TB trial via a holistic treatment support model including video-supported treatment

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People with TB enrolled in treatment-shortening trials face potentially heightened risk of poor treatment outcomes given the yet unproven efficacy and safety of investigational regimens. Ensuring they are the center of care and treatment provided within these trials is paramount. The PAN-TB trial implemented a holistic person-centered treatment support model to ensure this, including provision of a treatment support worker, use of a secure smartphone video app for documenting medication ingestions, and nutrition support among others.
This presentation will describe the trial's model and present participant-level adherence data and feedback on the app-based video-supported treatment from participants and trial staff.

In pursuit of non-culture-based TB treatment response biomarkers: Results from novel biomarker assays in the PAN-TB trial

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Sputum-based culture assays remain the gold standard microbiologic test for evaluating new TB drugs and regimens despite their many limitations. Numerous biomarkers, both sputum-based and non-sputum-based, are currently being investigated for their ability to measure a drug or regimen's bactericidal and/or sterilizing ability against Mtb or the impact of treatment on the host response against Mtb.
This presentation will share results from the PAN-TB trial's evaluation of multiple treatment response biomarkers, including sputum-based (mycobacterial load assay [MBLA], lipoarabinomannan [LAM], GeneXpert Ultra, and ribosomal RNA synthesis ratio [RS ratio]) and non-sputum-based (host transcriptomics, C-reactive protein) assays.

Protecting participants and preserving endpoints in treatment-shortening trials: Experience implementing a stop-treatment-and-watch framework in the PAN-TB trial

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Participants in TB trials evaluating investigational treatment-shortening regimens face potentially heightened risk of poor treatment outcomes given the regimens' yet unproven efficacy and safety. Simultaneously, trial investigators may introduce bias against investigational regimens when an open-label design is required due to inherent blinding challenges.
This presentation will describe the Stop-Treatment-and-Watch (STrAW) framework in the PAN-TB trial which was implemented to balance these important risks by protecting participants and supporting investigators. The framework consisted of an external concilium providing real-time review of potential unfavorable outcomes and delivering participant-level treatment monitoring reports to investigators. Data on concilium utilization will be presented.

SY07-170-07 Aligning priorities: Integrating TB and maternal health for better outcomes

Chair: Chidimma Okoye, Catholic Caritas Foundation of Nigeria, Abak, Nigeria
Chair: Beatrice Wangari Kirubi, Stop TB Partnership, Geneva, Switzerland

This symposium explores innovative and context-specific approaches to integrate tuberculosis (TB) screening, diagnosis, and care into maternal, newborn, and reproductive health services. With growing recognition of the vulnerability of pregnant and postpartum women to TB, especially in high-burden and underserved settings, this session highlights operational models and field experiences from Papua New Guinea, India, and Afghanistan, and broader research needs and gaps.
Presentations will examine strategies to leverage antenatal and postnatal platforms for TB detection, engage community health workers to improve referral and treatment outcomes and apply digital tools such as AI-assisted chest X-ray screening. Discussions will focus on the feasibility, acceptability, and effectiveness of integrating TB care within existing maternal and child health services, including challenges around stigma, resource constraints, and system readiness. The session will also identify persistent gaps in evidence and delivery systems while outlining key priorities for future research, innovation, and scale-up in TB-maternal health integration.

TB and pregnancy; what we don't know and need to know

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While the World Health Organization highlighted the increased risk of TB in pregnancy for the first time in 2023, estimates of the burden of disease in this important population are lacking. TB is estimated to contribute to 6-15% of maternal mortality and contributes to poor perinatal outcomes. Yet, there are few examples of integration of TB screening into antenatal care services and limited evidence to support effective TB management during pregnancy. This presentation will discuss important research priorities to address these gaps.

Integrating Tuberculosis Care into Maternal and Newborn Health Services in Papua New Guinea

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This presentation highlights challenges and success of integrating tuberculosis (TB) screening and treatment into maternal, newborn, and child health services. Implemented at Port Moresby General Hospital, the initiative links peri-partum women and their families to TB care using innovative tools like AI-assisted chest X-rays and hospital-based screening.
With over 12,000 maternal screening points and a 1.7% TB detection rate, the project highlights the importance of embedded TB care on improving early diagnosis and treatment initiation among pregnant and post-partum women in high-burden settings.

Connecting Care: Home Visits & Screenings, Transforming TB & Pregnancy in India

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In rural Bihar‘s underserved communities, ASHA workers are vital in reaching pregnant women in Bihar‘s remote and marginalized areas for TB screening. By addressing myths and connecting presumed symptomatic pregnant women to public health systems for diagnosis, they enable focused antenatal care, institutional delivery, and successful TB treatment during regular home-visits leading to improved maternal health.

Addressing the challenge of Tuberculosis among clients seeking maternal and reproductive health services in Afghanistan

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In Afghanistan’s fragile health system, maternal and child health (MCH) services served as strategic entry points for TB screening among women, who bear a disproportionate burden of disease. Through the TB REACH Wave 10 project, TB screening was integrated into antenatal, delivery, postnatal, family planning, immunization, and nutrition services. Over individuals with 1,300 TB were diagnosed—including bacteriologically confirmed and clinically diagnosed cases—with nearly 90% completing treatment. By leveraging routine MCH visits and engaging frontline providers, the project demonstrated the feasibility and impact of integrating TB services into reproductive health platforms in resource-constrained, high-burden settings.

SY08-180-08 Crossing borders: Addressing TB in migrant and refugee populations

Chair: Tereza Kasaeva, WHO Global Tuberculosis Programme, Switzerland

Human migration and displacement are social determinants of the tuberculosis (TB) epidemic. Globally, about 1 billion (or one in eight) people have migrated or have been forcibly displaced. Migrants, refugees, asylum seekers, and internally displaced persons are at significantly higher risk of developing TB due to overlapping social, structural or biomedical determinants and risk factors, including limited access to health care and poor living conditions. In 2024, WHO, in collaboration with the World Innovation Summit for Health, Qatar Foundation, published a technical report focused on combating TB in refugees and migrants. The report proposes ten key policy options to address TB among refugees and migrants.
This symposium will provide an overview of the policy options and will feature cross border and country focused examples on best practices with regards to TB prevention and care among migrant and refugee populations.

Innovative solutions for the elimination of TB among migrants and refugees

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Refugees, migrants, and other displaced people are disproportionately vulnerable to TB. The World Health Organization in collaboration with the World Innovation Summit for Health, Qatar Foundation, have outlined innovative solutions and policy options to address TB in migrants, refugees and internally displaced persons in their 2024 report: "Innovative solutions for the elimination of tuberculosis among migrants and refugees"
The report outlines ten key policy options to effectively prevent and address TB among these groups, which will be the feature of this presentation and when adopted are expected to contribute towards improved health and well-being of refugees and migrants.

TB and drug-resistant TB in migrants and conflict-displaced populations: The experience of the MSF-TB project in Poland, responding to the Ukrainian crisis

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The presentation will address the context of MSF's intervention in Poland in response to the Ukrainian crisis, highlighting key activities, challenges, and achievements. Focus will be on barriers faced by Ukrainian refugees in seeking and adhering to TB care, and MSF's response. It will showcase the catalytic effect of operational and advocacy activities conducted in collaboration with key stakeholders, as well as remaining challenges in access to TB medicines, the person-centered model of care, and implementation of WHO recommendations.

Addressing cross-border TB burden: IOM experience in regular migration pathways

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Addressing TB has never been easy, doing that in migrant populations crossing borders is a major challenge requiring close collaboration between all relevant stakeholders and, of course, empowering migrants themselves. Key factors include fast and efficient diagnosis of TB during the migration process, preventing TB resistance, ensuring health education, good electronic documentation, cross-border information sharing and continuity of care. IOM Health Assessment Programming is uniquely positioned to facilitate the required connections and will be presenting key recommendations and best practices developed in this area.

From Risk to Resilience: Collective Action to End TB in Humanitarian Settings

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TB is both preventable and curable, yet it continues to take lives among refugees and other displaced populations who face barriers to access and continuity of care. UNHCR's upcoming Global Public Health Strategy (2026-2030) calls for inclusion in national systems, catalytic partnerships, sustainable financing, community resilience and safeguarding essential services throughout all phases of displacement. UNHCR works with governments, WHO, and partners to close TB care gaps, ensur-

ing continuity across borders, building resilient health systems, multisectoral approach and advancing global TB elimination while protecting the most vulnerable.

The Need for Rights-Based Responses on TB in Migrant and Refugee Populations

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As a TB survivor born in a Tibetan resettlement camp in India, Tenzin offers affected community narratives to this discussion on TB among migrant and refugee populations. Building on the 2024 WHO/WISH report, Tenzin will highlight civil society perspectives on the ten proposed policy options, emphasizing the need for barrier-free access to TB care, social protections, and community engagement. Civil society and affected communities are key in translating policy into practice, ensuring accountability, and addressing stigma and legal barriers.

SY09-190-09 How to improve trials and development, and ensure uptake, of innovations to prevent, diagnose, and treat TB

Chair: Ani Herna Sari, Rekat Peduli Indonesia Foundation, Indonesia
Chair: Anneke C. Hesseling, Desmond Tutu TB Centre, Stellenbosch University, Cape Town, South Africa

Major advances in preventive therapy, treatment for active DS- and MDR/RR-TB have emerged through clinical trials in recent years. These innovations have been codified in marketing authorizations and/or WHO endorsements. Major evidence gaps persist, however, which constrain uptake generally and in priority populations.
This symposium will highlight common gaps in clinical development and their consequences. Speakers will discuss omnipresent tensions between research expediency and production of high-certainty, comprehensive evidence, frameworks to weigh priorities, and alternative strategies that can be deployed to fill these gaps.

When are uncontrolled trials in TB scientifically and ethically justified: Borrowing wisdom from early AIDS clinical trials

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In a 1989 paper, Byar and colleagues established five conditions for the use of uncontrolled trials for HIV. A number of recently completed trials have changed global standards of care for TB and multidrug/rifampin-resistant TB. Trials have used a variety of strategies for comparison, ranging from no or an external, historical comparator to a fixed or evolving internally controlled comparator regimen(s). With new trials imminent, it is timely to reconsider the role of uncontrolled trials in TB treatment research, guided by the five conditions from Byar et al, current ethical standards (Helsinki, CIOMS), and new WHO Guidelines for Evidence Generation.

Toward earlier inclusion of pregnant and breastfeeding women in TB treatment trials

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The World Health Assembly Resolution WHA75.8 (May 2022), calls for transforming clinical trial practices, including for underrepresented populations. Pregnant and postpartum women have an increased risk of developing TB compared to the general population, however, pregnant women have historically been excluded from TB trials.

To address this, the WHO Global Programme on Tuberculosis and Lung health initiated a consensus-building process on optimal inclusion of pregnant and lactating women in TB trials, culminating in a consensus meeting in early 2025.
This presentation summarizes the consensus process and the resulting consensus statement and call to action.

Continuity of care among TB treatment trial participants whose study treatment is discontinued

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Participation in TB clinical trials requires adherence to study protocol and regimen. Deviation from those standards, however, is sometimes required in a participant's best interest, notably for poor treatment response or treatment-limiting toxicity. Some trials are discontinued prematurely.
Two recent examples are (TB-PRACTECAL) stopped for efficacy and (PAN-TB) for futility relative to the study objective. Regardless of the reason, participants whose study treatment is prematurely interrupted typically require additional treatment in the local context.
How should these risks be communicated to participants?
How should participants of clinical trials be monitored when study treatment?
What are the responsibilities of sponsors and sites?

Best practices for paediatric investigational plans in TB drug/regimen development

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This presentation will outline best practices for paediatric investigational plans (PIPs) in TB drug and regimen development, highlighting current challenges such as delayed initiation, fragmented and stand-alone studies, limited site capacity and suboptimal trial design.
Drawing on insights from the CHEETA project, it will explore strategic solutions to optimise paediatric trial design, accelerate access to novel treatments, and ensure regulatory readiness across development stages.

SY10-200-10 Uniting voices for equitable TB care in Europe: Advancing people-centred diagnosis and treatment

Chair: Ilaria Motta, University College London (UCL), Medecines Sans Frontieres (MSF), London, United Kingdom
Chair: Senia Rosales-Klintz, European Centre for Disease Prevention and Control, Sweden

Access to timely diagnosis and effective treatment in the European Union, European Economic Area (EU/EEA) and the United Kingdom (UK) remains challenging due to disparities in healthcare systems, high costs of newer TB medicines, and restrictive regulatory policies. Vulnerable populations—such as migrants, children, and those with multidrug-resistant TB—face even greater barriers, including delays in diagnosis, limited treatment options, and inadequate social support.
Additionally, bureaucratic hurdles and lack of patient-centred approaches often leave those affected feeling unheard and underserved. This symposium targets clinicians, policymakers and advocates and will discuss the general landscape for TB care in the EU/EEA and the UK, with insights to access to medicines and diagnostics and exploring possible solutions via examples from countries. A final call to action will be articulated to reinforce the adoption and integration of a patient-centred approach within tuberculosis care frameworks.

Regional landscape of TB care in the European Region

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The first talk will give an overview of TB care landscape across the European Region, highlighting key trends, challenges, and opportunities for action. While TB incidence is declining overall, significant disparities persist, especially amid the current humanitarian crisis in Europe, in access to timely diagnosis, WHO-recommended treatment and care for vulnerable populations, including migrants and those with drug-resistant TB.
The session will underscore the importance of equity-focused, people-centred approaches and stronger regional collaboration. United action and sustained advocacy are needed to expand access to high-quality TB services and accelerate progress toward global and regional targets to end TB across Europe.

From innovation to implementation: Access challenges for TB diagnostics in the European Region

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This presentation examines the challenges and priorities in achieving equitable access to TB diagnostics across the EU/EEA and the UK. Despite the increased availability of advanced tools for TB detection, drug resistance testing, and genomic surveillance, their use is inconsistent and key and vulnerable populations often face limited diagnostic options due to funding gaps and fragmented policies.
The talk will highlight the importance of cross-border collaboration in monitoring TB and MDR-TB transmission, discussing the role of the European Reference Laboratory Network for TB, coordinated by the ECDC. The session will propose actions to close the diagnostic-access gap and maximise public health impact across Europe.

Access to TB medicines in the European Region: Challenges and potential solutions

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Access to TB medicines in the EU/EEA and the UK remains challenging due to lack of registration or commercialisation, and high costs of newer or repurposed drugs. While quality-assured generics are available globally, their absence in the EU/EEA and the UK hinders implementation of WHO treatment guidelines and limits patient access to optimal care.
This presentation will outline the key barriers and explore potential solutions, such as streamlining regulatory pathways, reducing costs, and fostering collaboration with manufacturers and policymakers. The goal is to improve access, ensure equity, and align TB care in the EU/EEA and the UK with international standards.

Fostering availability of age-appropriate formulations for children with TB to tackle the worrying surge in paediatric TB in the EU/EEA

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Age-appropriate fixed-dose formulations for children with TB have been available since 2015 and implemented in over 120 countries. However, due to lack of registration at the European Medicines Agency, they are not available in EU/EEA countries. This leads to the use of crushed adult formulations with the wrong drug ratio or suboptimal formulations, negatively impacting adherence and treatment outcomes.
The presentation will provide an overview about strategies used by European countries to import these formulations as well as other initiatives ongoing to improve access.

From awareness to action: Mobilising advocacy for accessible TB medications in the European Region

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Building on the previous discussion, this talk will summarize the key actions countries can take to improve access to newer TB medications in low-burden regions like the EU/EEA, and the UK, where non-registration delays treatment. We will emphasize the need for streamlined regulatory processes and flexible approval mechanisms, such as conditional marketing authorization, to ensure timely access to life-saving drugs, especially for drug-resistant TB.
The session will call on regulatory bodies, governments, and pharmaceutical companies to collaborate and take urgent steps to break down barriers, ensuring equitable access to TB treatments across all regions.

SY11-210-11 Generating evidence: A call to action for the optimal inclusion of pregnant and lactating women in TB clinical research

Chair: Kerri Viney, World Health Organization, Geneva, Switzerland
Chair: Yael Hirsch-Moverman, Columbia University, New York, United States

TB contributes 6–15% of all maternal mortality. TB in pregnancy and postpartum is associated with adverse maternal and perinatal outcomes. Pregnant and lactating women have largely been excluded from TB clinical trials, resulting in a lack of access to the most effective therapeutic regimens. Most newer TB regimens are therefore not used during pregnancy or occasionally used without supporting data. Pregnant and lactating women have also been excluded from all previous and current TB vaccine trials. The WHO Global Programme on Tuberculosis and Lung Health initiated a consensus-building process on the earlier and optimal inclusion of pregnant and lactating women in TB therapeutic and vaccine trials. Evidence reviews were conducted to address gaps in data and knowledge and inform this process.
This symposium will deliver the latest TB estimates among pregnant and lactating women and disseminate new evidence generated from the WHO commissioned reviews for the 2025 Consensus process.

A pressing need: Reaching consensus on how to advance the early and optimal inclusion of pregnant and lactating women in TB clinical research

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Pregnant and lactating women are at high risk of developing TB, which is associated with increased risk of maternal and perinatal morbidity and mortality. Historically, pregnant and lactating women have been excluded from TB trials and thus cannot benefit from the latest innovations to prevent and manage TB.
A consensus-building process on inclusion of pregnant and lactating women in TB trials was initiated in 2023/2024. Five working groups (preclinical, therapeutics, vaccines, maternal TB surveillance, advocacy) were established. A consensus meeting was conducted in February 2025. This presentation summarizes the consensus process and the resulting consensus statement and call to action.

Hot off the press: The latest estimates of TB in pregnant and lactating women

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Tuberculosis risk is elevated during pregnancy and postpartum, contributing to adverse maternal, fetal, and infant outcomes. However, limited evidence and widespread underreporting obscure the true burden of tuberculosis in these populations. To address this gap, we synthesized data from WHO's age- and sex-disaggregated tuberculosis estimates, UN population and fertility data, UNAIDS HIV indicators, and findings from our systematic review and meta-analysis of tuberculosis incidence rate ratios during pregnancy and postpartum.
By integrating these data sources, we generated tuberculosis burden estimates (by HIV status) at country, regional, and global levels, offering new clarity on tuberculosis risks in this priority group.

Hot stuff: Systematic review on TB and pregnancy

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This presentation will review results of a systematic review on TB and pregnancy undertaken to inform the consensus process for the optimal inclusion of pregnant and lactating women in TB clinical research. Questions evaluated in the review include understanding how pregnancy-related immune changes affect testing for TB infection; risks of TB infection and disease among pregnant and lactating women; diagnostic accuracy of TB screening tools in pregnancy; safety of TB preventive treatment regimens in pregnant and lactating women; TB treatment outcomes among pregnant and lactating women; and incidence of adverse infant outcomes for pregnant and lactating women receiving TB treatment.

Turning up the heat: Pregnant and lactating women have been excluded from TB clinical trials for far too long

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To support the work of the global consensus process, we collated a systematic inventory of clinical trials conducted in the past 10 years or planned on TB treatment, TB prevention, and TB vaccines. We reviewed the trials and determined whether they included/excluded pregnant and lactating women. We also conducted in-depth inter-

views with 18 globally representative TB clinical trialists and sponsors, which explored barriers and facilitators to optimal inclusion of pregnant and lactating women in TB clinical trials.
This presentation will highlight findings from the systematic inventory and interviews and present strategies for earlier inclusion of this population in clinical trials.

Invisible mothers: Closing the data gap in maternal TB monitoring

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This landscape analysis highlights critical gaps in maternal TB surveillance and funding. Despite increased risks during pregnancy and the postpartum period, data on TB in this population remain sparse.
The report identifies structural barriers—including siloed health systems and limited integration with maternal and child health programs—and proposes strategic solutions like sentinel surveillance, data linkage, and leveraging existing registries. It calls for strengthening data collection on maternal TB, pilot programs in high-burden countries, and stronger cross-program collaboration.
Enhanced surveillance is key to improved maternal outcomes and attracting sustainable, multisectoral funding to address this under-recognized public health issue.

SY12-220-12 How can asymptomatic TB help the development and global impact of new TB vaccines?

Chair: Rhea Lobo, Stop TB Community Delegation, Australia
Chair: Richard White, London School of Hygiene and Tropical Medicine, London, United Kingdom

Our objective is to discuss how asymptomatic TB could help the development and global impact of new TB vaccines.
New TB vaccine trial results are due soon. At least 50% of prevalent TB is asymptomatic, and asymptomatic TB is likely important for TB infection transmission, but there are crucial asymptomatic TB unknows.
We present a community perspective on why asymptomatic TB and new TB vaccines matter to TB care/prevention, present a state of the art summary on asymptomatic TB and new TB vaccines, present a framework to determine if/how we could use asymptomatic TB to accelerate new TB vaccine development by reducing trial size/cost, present new modelling results that suggest whether new TB vaccines prevent asymptomatic TB may be crucial for global impact, and, present new evidence on the critical gaps we need to fill on asymptomatic TB to accelerate vaccine trials and maximise global impact of new TB vaccines.

A community perspective on why asymptomatic TB and new TB vaccines matter to global TB care and prevention

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The presentation will focus on two things: the time before we have new TB vaccines, when asymptomatic TB needs to be found and treated. 'All TB is TB!' I will also state that new TB vaccines are essential, and should be designed to prevent all forms of TB, particularly given recent global funding cuts. For too long, the TB-affected communities and TB survivors have waited for a vaccine.
Finally, I will describe how communities can continue to advocate for a new TB vaccine and support the awareness and implementation at the community level.

Why asymptomatic TB could accelerate TB vaccine development, and what do we know?

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In this talk, I will present what we do know and don't know about asymptomatic TB, give an update on TB vaccine trials, particularly with regard to asymptomatic TB, and how we could measure impact on asymptomatic TB, including which vaccine trials are doing so.

How could we fill the remaining asymptomatic TB knowledge gaps, to know if we can use aTB to accelerate vaccine trials?

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In this talk, I will present a summary of how we get the data we need to use asymptomatic TB to accelerate vaccine trials and maximise the global impact of new TB vaccines. These will range from observational to interventional studies, with the advantages and disadvantages highlighted. I will also present a summary of what data we know are currently being collected, and what are the critical remaining gaps are. This should lead to concerted global action to fill these gaps.

New modelling results suggest that the ability of new TB vaccines to prevent asymptomatic TB may be key to their global impact

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Our evolving understanding of the natural history of TB changes the way we think about new TB vaccines, and specifically about how the vaccine mechanism of action interacts with underlying TB stages.
In this talk, I will share new modelling analysis that suggests that whether new TB vaccines prevent asymptomatic TB may be critical to the global impact of new TB vaccines. Therefore, it is essential to measure the impact of new TB vaccines against asymptomatic TB.

What potential regulatory considerations may arise in TB vaccine clinical trials that incorporate asymptomatic TB as a study endpoint?

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I will present a framework to help determine if/how we could use asymptomatic TB to accelerate new TB vaccine development by reducing the size/cost of TB vaccine trials, including a potential regulatory perspective. What regulators might think about a asymptomatic TB trial endpoint will be critical. I will bring insights from my knowledge of the regulation process to this discussion - how regulators work, what evidence they are likely to need to consider a change in licensure endpoint, and other information from this perspective that would be useful for TB vaccine trialists and TB epidemiologists to know.

SY13-230-13 Innovative TB screening and diagnosis at healthcare facilities to find the missed millions: Evidence from four high-burden TB countries

Chair: Cecily Miller, World Health Organization , Geneva, Switzerland
Chair: Monde Muyoyeta, Centre for Infectious Diseases Research in Zambia, Zambia (CIDRZ), Lusaka, Zambia

Lack of access to TB screening, diagnosis and linkage to care is a key contributor to TB morbidity and mortality with 25% of people with TB being "missed" globally.
Start4All is a seven-country UNITAID-funded project aiming to address this by evaluating novel point-of-care TB screening and diagnostic combinations, including in lowest level healthcare facilities.
By March 2025, Start4All had recruited 15,000 adult participants, who kindly provided: two spontaneous sputa, capillary blood, urine, and a chest x-ray (CXR). Tests performed included CXR computer aided detection (CAD), pooled molecular sputum testing, C-Reactive Protein, and urinary lateral-flow assay; all evaluated against microbiological reference standards (individual sputum molecular test and/or culture).
Here, we present an overview of the performance of tests and test combinations implemented at primary healthcare facilities and district hospitals in Nigeria, Malawi, Kenya, and Brazil; and consider the challenges, successes, and lessons learnt locally to facilitate future implementation and potential scale-up.

The Start4All Project: Enhancing TB diagnosis and linkage to care across seven high-burden countries

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Start4All is evaluating innovative TB screening and diagnostic test combinations to enhance linkage to care, particularly in primary healthcare and community settings, and amongst underserved groups. Screening tests include C-reactive protein (CRP), chest x-ray with computer aided detection (CAD), urinary LAM, and pooled sputum testing. By March 2025, Start4All had recruited >15,000 participants (including ~1,000 children, 1-14 years) from Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Viet Nam.
This session will share real-world case studies, community engagement learnings, and key findings on the effectiveness, cost-effectiveness, feasibility, acceptability and scalability of TB screening and diagnostic algorithms to find the "missed millions".

Identifying optimal TB screening and diagnostic strategies at the frontline in Malawi

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In a mixed-methods cross-sectional study, we evaluated the performance of: C-reactive protein (CRP), computer-aided X-ray diagnosis, pooled sample Xpert Ultra testing, and urine lipoarabinomannan (LAM) testing and investigated whether test combinations had the potential to increase the proportion of people diagnosed with bacteriologically-confirmed TB among adults seeking primary healthcare services at three health facilities in Blantyre, Malawi.
We used trained research nurses to deliver the point of care tests (CRP and LAM) and ministry of health personnel at the facilities to conduct the X-rays and Xpert ultra tests. Here, we present the results of the 574 participants with presumptive TB.

Innovations in point-of-care TB screening and diagnosis at healthcare facilities to find the missed millions: implementation evidence from Nigeria

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By March 2025, Zankli Research Centre, Nigeria, implementing partner on Start4All, had recruited 1,703 adult participants who provided two spontaneous sputum samples, capillary blood, urine, and a chest X-ray (CXR). Tests conducted included computer-aided detection (CAD) on CXR, pooled Xpert MTB/RIF testing, C-reactive protein, and a urinary lateral-flow assay, alongside microbiological reference standards.
Here, we share an overview of implementation at two primary healthcare facilities and a district hospital in Nigeria, highlighting operational experiences, challenges addressed, successes achieved, and lessons learnt to inform future deployment and potential scale-up.

Lessons from the field on implementation and evaluation of novel TB screening and diagnostic tests in primary healthcare facilities in Brazil

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As part of the Unitaid-funded Start4All project, 306 adults aged 15 years and above with presumptive TB were recruited, predominantly from primary healthcare facilities in two sites, Maceio and Aracaju, Brazil. All participants provided sputum, urine, capillary blood, and a chest x-ray (CXR). We then evaluated the performance of screening tests including computer-aided detection (CAD) CXR, urinary lipoarabinomannan (LAM), and pooled testing of sputum by Xpert Ultra, against individual Xpert Ultra and mycobacterial culture of sputum. Here we present practical lessons learnt about introducing new screening and diagnostic tests at primary healthcare level and consider policy and practice implications.

Real-world challenges and successes of expanding novel TB screening and diagnostic tests in the health system in Kenya

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START4ALL Kenya sites recruited 799 adults (15 years+) with presumptive TB, of whom 46% (367/799) were HIV positive, over seven months between 2024 and 2025, Implemented by the Kenyan Medical Research Institute, the sites relied on strong partnerships with the Ministry of Health and County Governments. Challenges included changes in public healthcare grading of sites that reduced client attendance and seasonal variations in healthcare seeking. Successes included radiography being introduced for the first time in Rabuor Sub-county Hospital, supporting referrals from nearby centres; and adaptability and strong local collaboration with public health bodies to facilitate policy and practice change.

SY14-240-14 Delivering multi-drug-resistant TB services in war and complex emergencies: A joint symposium with IOM, MSF, The Union, and WHO

Chair: Medea Gegia, WHO HQ, Geneva, Switzerland
Chair: Anita Mesic, Médecins Sans Frontières, Amsterdam, Netherlands

Nearly 300 million people live in countries affected by war or complex emergencies (CE), where antimicrobial resistance (AMR) is an emerging concern. Modern conflicts are increasingly prolonged and frequent, severely disrupting health systems and compromising tuberculosis (TB) care. War and postwar conditions may accelerate TB drug resistance due to fragmented healthcare access, treatment interruptions, and increased vulnerable populations. Given the global rise in CE, there is an urgent need to analyze existing evidence to improve multidrug-resistant TB (MDR-TB) management in these settings. However, published research on this topic remains scarce.
This symposium explores the role of conflict in driving AMR, particularly drug-resistant TB, and the challenges of providing continuous care. It brings together field experts from NGOs, key institutional stakeholders, and funders to discuss innovative strategies for MDR-TB management in fragile settings, aiming to strengthen response mechanisms and ensure treatment continuity despite healthcare system disruptions.

Multi-drug-resistant TB in war and complex emergencies: Consequences, gaps and potential ways forward

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This introductory session explores the modern war and shifting dynamics of TB in these complex scenarios, including their impact on multidrug-resistant tuberculosis (MDR-TB) due to disrupted TB services. It reviews available evidence and insights from regional Green Light Committee missions on MDR-TB management in crisis-affected countries. Key discussions include priority populations, research gaps, funding strategies, and policy development to enhance MDR-TB care in humanitarian settings.
The session also examines targeted interventions to improve patient outcomes, emphasizing the need for innovative, sustainable approaches to ensure treatment continuity amid instability.

Overcoming challenges of Multi-drug-resstant TB care in the Democratic Republic of Congo: The case of North Kivu

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Médecins Sans Frontières (MSF) intervient dans des contextes parmi les plus complexes et instables au monde, tout en contribuant significativement à l'avancement du traitement de la tuberculose pharmacorésistante (TB-MR) par la recherche clinique et le soutien aux programmes nationaux de lutte contre la tuberculose. Cette présentation met en lumière l'expérience de MSF au Nord-Kivu, en République démocratique du Congo, une région marquée par une insécurité chronique, un système de santé affaibli et un accès limité aux soins. Nous explorons les principaux défis de la prise en charge de la TB-MR, notamment les déplacements de population, les lacunes en matière de soutien psychosocial et le manque d'engagement communautaire. L'accent est mis sur le renforcement des capacités locales, la garantie d'un approvisionnement fiable en médicaments et la promotion d'approches intégrées pour améliorer les résultats des patients.

Maintaining multi-drug-resistant TB services for refugees of the Ukraine war: The experience of Poland

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The war in Ukraine caused mass population movements, within and outside of the country as well as disrupting the TB program activities. To maintain continuity of treatment for TB patients forced to flee the country, adapted models of care in neighboring countries were necessary. This was achieved through political will and collaboration between host countries, WHO and supporting agencies. We describe the actions taken that have succeeded in ensuring quality of care of those affected.

Against all odds: Reduction of drug-resistant TB incidence in Niger, a public health success story

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In a context of persistent insecurity and systemic challenges, Niger achieved a marked reduction in drug-resistant tuberculosis (DR-TB) from 2015 to 2024. Despite limited resources, the National Tuberculosis Program and partners like Damien Foundation implemented targeted interventions: continuous training for healthcare workers, private-sector-supported sample transport, expansion of rapid diagnostics and treatment centres, and quarterly supervision.
A strong focus on patient-centred, ambulatory care included transport and nutritional support, peer-led home visits, contact screening, shorter regimens, and robust pharmacovigilance. Strengthening the DR-TB drug supply chain was also prioritised. This multifaceted approach proved effective even in a fragile, insecure setting

Progress and lessons learnt in management of multi-drug-resistant TB in complex emergencies in the Eastern Mediterranean Region: 2018-2024

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In 2022, Global Fund-supported countries in the Eastern Mediterranean Region faced complex emergencies, accounting for 32% of estimated MDR/RR-TB cases. Progress and challenges in managing drug-resistant TB were assessed, reviewing rGLC mission reports and analyzing data. Testing for TB and RR increased significantly from 2018 to 2022, leading to a 24% rise in MDR/RR-TB patients treated.
All six countries implemented oral treatment regimens, with two adopting the 6-month BPaL(M) regimen. Treatment success varied, highlighting the need for improved management strategies.
Recommendations include enhancing diagnostic capacity, optimizing specimen transport, decentralizing services, and prioritizing the BPaL(M) regimen for expansion.

SY15-250-15 The paediatric TB meningitis SURE trial: What have we learnt?

Chair: Varinder Singh, Lady Hardinge Medical College and Assoc Kalawati Saran Children's Hospital,, New Delhi, India
Chair: James Seddon, Stellenbosch University, Cape Town, South Africa

Tuberculous meningitis (TBM) is the most severe form of tuberculosis in children with high mortality and rates of neurological sequelae. Evaluation of better anti-tuberculosis treatment regimens and adjuvant therapies is urgently needed. The SURE trial (short intensified treatment for children with Tuberculous Meningitis) is a randomised, factorial designed, controlled trial conducted at nine sites in Vietnam, India, Zambia, Zimbabwe, Uganda and co-ordinated through the MRC Clinical Trials Unit at UCL, London. The trial compares head-to-head for the first time, the non-inferiority of a short intensive TBM treatment regimen of four drugs, at higher doses for six months (H20 R30 Z40 L20) against standard 12-month WHO regimen and, factorially, the effect of aspirin 20 mg/kg versus placebo as adjuvant therapy for 8 weeks, on mortality and neurosequelae.
We will present baseline/outcome data from the primary 48-week analysis of 369 children, and results of main substudies, and describe experiences/challenges of trial implementation.

Overview of the SURE trial design, conduct and results

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We will describe the rationale for the SURE trial, trial design and challenges in conducting the trial and results from the primary 48 week analysis.

Low paediatric lumbar puncture rates highlight the need for sustained and effective interventions to improve diagnosis of paediatric TBM

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Globally over 1.2 million children suffer from CNS infections annually, mainly in Africa and Southeast Asia, yet LP rates remain low. Without a LP children may fail to receive the correct diagnosis or optimal treatment for CNS infections with high mortality/morbidity. Barriers include societal fears, cultural beliefs, consent delays, untrained staff and resource shortages. We found weekly numbers of paediatric CSF samples routinely sent to laboratories at African SURE tertiary hospitals was low.
We show how training improved LP rates in the short-term, but sustained impact requires ongoing education, community awareness and strengthened healthcare resources.

Pharmacokinetics (PK) and pharmacodynamics (PD) of TB drugs in the SURE trial

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We will describe the design of the SURE PK and PD substudy and the achieved exposure to TB drugs in plasma and CSF. Possible predictors of exposure (eg age, weight, gender, acetylator status) will be presented.
To facilitate the implementation of the intensified regimen we will assess if combination of dosing weight bands still results in attainment of adequate exposure to TB drugs. The relationship between drug exposure and efficacy and safety/tolerability will contribute to explaining findings of the SURE trial and provide possible leads for further treatment optimisation.

Neuro-imaging in the SURE trial

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The MRI substudy evaluates the impact of aspirin on ischaemic brain changes in children with TBM across India and Vietnam. MRI scans at baseline and six months were centrally reviewed by neuroradiologists, blind to randomised arm, using standardised protocols.
This substudy aims to generate robust imaging-based evidence to guide TBM management and, additionally, it enables us to present detailed imaging findings of childhood TBM in high-prevalence regions. Results should inform future clinical and research practice.

Post-TBM neurological sequelae: outcomes and challenges

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TB meningitis causes long-term neurological disability in over 50% of children who survive. However, functional impairments are poorly characterised especially in LMICs. All children had functional assessments performed at baseline, 24, 48 and 72 weeks by trained staff using the paediatric modified Rankin Scale (mRS) and Liverpool Outcome Score (LOS).
We will report mRS and LOS outcomes at 24 and 48 weeks post-diagnosis, including differences between antituberculous treatment groups, anti-inflammatory (aspirin vs placebo) arms, as well as relationship to baseline factors. These results will provide a better understanding of disease burden in this vulnerable population across different geographical regions globally.

SY16-260-16 CAD-supported chest radiography for TB screening and diagnosis in children as well as young adolescents: Key advances and remaining gaps

Chair: Martina Casenghi, Independent Consultant, Geneva, Switzerland
Chair: Cecily Miller, World Health Organization , Geneva, Switzerland

Children and young adolescents with TB are disproportionally under-diagnosed and remain amongst the most vulnerable groups affected by this disease. Although the role of chest X-Ray (CXR) in supporting diagnosis of intrathoracic TB and in assessing disease severity in children is increasingly recognized, access to quality CXR reading and interpretation remains a significant barrier in TB endemic settings. In older adolescents and adults, CXR interpretation has recently been facilitated using software for computer-aided detection (CAD) of TB, recommended by WHO for TB screening in these populations. However, its applicability to children and young adolescents remains to be determined.
This session will discuss ongoing efforts on the optimization of CAD software for applicability to people below 15 years of age and review most recent evidence on performance of CAD-supported CXR for screening and diagnosing TB in this population. We will also discuss remaining knowledge gaps and strategies to address them.

Performance of available CAD algorithms for identifying TB in children and adolescents: Results from the CAPTURE Consortium multi-country CXR dataset

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Through the CAPTURE consortium initiative, we established a large (>8000 images), well-characterized, multi-country archive of CXR images from children and young adolescents (0-14 years) with presumptive TB.
We used this repository to conduct an independent evaluation of the accuracy of 7 currently available CAD algorithms to identify childhood TB against several reference standards including composite clinical (standard NIH clinical case definitions), microbiological (confirmed TB) and radiological (expert human classification).
We present the results of this evaluation.

Start4All: The evaluation of CAD for childhood TB in Cameroon and Viet Nam

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Start4All is a global tuberculosis research consortium working across seven high burden countries funded by Unitaid and hosted by the Liverpool School of Tropical Medicine in collaboration with Stop TB Partnership.
Start4All has prospectively recruited children with TB symptoms aged 14 years and below from healthcare facilities in Cameroon (n=518) and Viet Nam (n=291) to develop a paediatric CXR library with microbiological, clinical and human interpreted radiological reference standards.
Start4All invited CAD manufacturers to share their paediatric software to perform an independent evaluation. Here we present the results.

Evaluation of CAD performance for diagnosis of TB in children: Evidence from the multi-country TACTiC study

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TACTiC is a multi-country initiative led by MSF to support the implementation of the 2022 WHO guidelines for TB management in children and adolescents. As part of TACTiC, approximately 750 chest X-rays (CXR) have been collected with corresponding clinical information, laboratory results and expert radiologists' interpretations. These CXR images were retrospectively analyzed using the latest CAD version of qXR (Qure.ai), trained specifically to identify TB in children. The performance of qXR was evaluated against different reference standards, including bacteriologic confirmation, expert CXR interpretation and a composite standard, to assess the potential of CAD in supporting TB diagnosis in children

Evaluating CAD performance in combination with minimally invasive tools for young children with presumed TB: First findings from the NOD-pedFEND study

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NOD-pedFEND is a multi-country diagnostic accuracy study focusing on children under five with signs and symptoms suggestive of tuberculosis (TB)– a distinct, challenging, and often overlooked cohort.

This presentation will discuss preliminary findings on the performance of selected CAD products compared to expert readers and clinical/microbiological reference standards, as well as their use in combination with other diagnostic tools in the NOD-pedFEND cohort.
The talk will provide insights into the role that CAD can have in pediatric TB diagnosis today, while prompting considerations on future avenues for CAD integration into diagnostic pathways and optimized testing modalities for young children.

Development of a paediatric TB-CAD evaluation framework: Key updates from a consensus building process

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To support generation of the evidence needed to inform WHO recommendations on the use of computer-aided detection (CAD) for TB in children, a scoping review and a Delphi survey were conducted.
The review found promising diagnostic accuracy but limited pediatric-specific data and high variability in reference standards used. The Delphi process refined criteria for study design, training needs, and ethics. Experts emphasized the critical importance of prospective data collection, inclusion of high-risk subgroups, and equity assessment.
Insights from both exercises informed the development of a pediatric TB-CAD evaluation framework, which will be presented and discussed

SY17-270-17 Tomorrow is here: Innovative financing for the future of TB funding

Chair: Wim Vandevelde, Global TB CAB & Unitaid Communities Delegation, South Africa
Chair: Lindsay Palazuelos, Partners In Health, Boston, United States

The collapse of USAID funding and cuts to aid budgets across Europe have completely transformed the global health landscape. The need for innovative approaches to funding TB programs and research has never been more evident and pressing.
This session will open by outlining major changes to the TB funding landscape since Union 2024 and the impact funding cuts and instability have on TB programs and communities most affected by TB. The second half of the symposium will introduce innovative approaches to creating fiscal space for domestic investments in TB and health programs in low- and middle-income countries: 1) new multilateral and domestic financing frameworks to bolster investments in TB and health; 2) sovereign debt relief and reform; and 3) special drawing rights for sustainable investment in TB programs. Paired together, these solutions can overcome the inherent instability of foreign assistance-led investments in health and meet the end TB goals.

Where are we now: A landscape of TB funding changes and challenges in 2025

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Funding for TB has long been inadequate, falling far short UN High Level Meetings on TB commitments. With some exceptions, the trend in domestic TB funding has been downwards since Covid-19 put unprecedented pressure on public finances. The termination of USAID grants and cuts to development aid across Europe created further funding shortfalls at all levels.
This presentation will analyze the transformation of the TB funding landscape in 2025, how the field adapted, who filled gaps, the role of parliamentarians in shaping domestic and foreign funding, and make the case for innovative approaches to funding critical TB services and research.

When aid fails: The impact of USAID terminations on TB affected communities

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The withdrawal of USAID funding left countless individuals across high-TB burden countries facing shuttered TB clinics, terminated clinical trials, looming drug shortages, and no clear options to receive TB care.
This presentation will share perspectives on the crisis from TB affected communities across Kenya. By demonstrating the impacts of funding withdrawals on communities most affected, this session will underscore the urgency of innovative, locally-led approaches to sustainable funding for TB programs and care.

Building a new funding order: Reforming TB finance towards domestic driven agendas

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The recent changes to the funding landscape has underscored the need for innovation in TB financing for service delivery and R&D in order to meet the 2023 UN High Level Meeting commitments and ambition to end TB. This session focuses on novel financing solutions to unlock fresh sources and mechanisms of investment for TB.
The session will provide an overview on innovative multilateral and domestic funding models (e.g., health levies, social health insurance schemes, blended finance, etc.) and approaches to North-South lending that can be deployed towards investments in TB and health programs.

Sovereign debt relief and reform as pathway to domestic resource mobilisation for investments in TB

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Since 2010, global public debt has grown from $51 trillion to over $97 trillion, continuing to rise across the Global South – with payments to interest outpacing investment in health programs. Per IMF and WHO designations, 43% of high TB burden countries are in or approaching debt distress, unable to fulfill financial obligations. As debt burdens grow, countries turn to austerity measures to remain solvent and avoid default – at the expense of investing in TB programs, R&D, and other public services.
This session proposes debt relief and legislative reform as foundational tools toward robust, sustainable, and country-led TB financing.

The untapped potential of Special Drawing Rights (SDRs) in the fight against TB

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Special drawing rights (SDRs) are a reserve asset allocated to IMF member countries to support global economic stability during crises. A recent distribution allocated $650 billion worth of SDRs to countries to fund COVID-19 response. SDR allocations can be leveraged by LMICs to create fiscal liquidity for domestic investments in health programs or by wealthier nations to fund trusts to invest in health and SDG goals in LIMCs, outside traditional development budgets.
This presentation lays out the pathway for the use of SDRs to fill immediate gaps in TB funding and to develop sustainable multilateral funding mechanisms beyond traditional ODA.

SY18-280-18 Optimising TB screening as a critical gateway to TB care: Recent advances in available and emerging tools and technologies

Chair: Cecily Miller, World Health Organization , Geneva, Switzerland
Chair: Martina Casenghi, Independent Consultant, Geneva, Switzerland

Screening for tuberculosis (TB) represents a critical tool in addressing the TB detection gap and for reducing TB prevalence and transmission in TB-endemic settings. Accurate, affordable and practical tools for TB screening are essential to enable its implementation. Recent advancements, including AI-driven computer-aided detection (CAD) for chest X-rays (CXR), rapid molecular diagnostics, and blood-based biomarkers, have enhanced the accuracy and coverage of TB screening in many high-burden settings.
However, key challenges persist in optimizing technology selection, accessibility, and large-scale deployment needed to bridge the detection gap and reduce TB burden globally. Development and evaluation of novel screening tools and approaches is urgently needed to identify solutions for rapid deployment at scale.
This session will present recent updates to the WHO target product profiles for TB screening tests, the latest evidence on WHO-recommended TB screening technologies, and early data on the most promising emerging innovations in the field.

Updated WHO Target Product Profiles for novel TB screening tools and technologies

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This year, WHO released updated target product profiles (TPPs) for TB screening tools. Since the first TPPs for screening were released in 2014, there have been significant advancements in screening technology.
However, given the persistent global case detection gap and growing recognition of the burden of asymptomatic TB, underscoring the necessity of scaling up symptom-agnostic screening, there is an urgent need for screening tools with the accuracy, feasibility and cost profile required to implement effective screening at scale.
This talk will present WHO's updated TPPs for novel screening tools and highlight what is needed to spur future innovations.

Head-to-Head comparison of CAD-CXR, LF-LAM and CRP for TB screening: Results from the Start4All study

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Start4All is a Unitaid-funded project, led by the Liverpool School of Tropical Medicine, focused on global improvement of TB screening, diagnosis, and linkage to care. During phase one, approximately 15,000 participants were recruited at facilities and communities across seven countries. Screening and diagnostic tests evaluated include the C-reactive protein assay, chest X-ray with computer aided detection (CAD), lateral flow urine lipoarabinomannan (LF-LAM), and rapid molecular testing on pooled sputum.
This presentation will share results from a head-to-head evaluation of diagnostic accuracy of screening tests, and modelled performance of the most promising algorithms, offering critical insights into optimized TB screening approaches.

CAD-supported CXR for TB screening: Review of latest evidence and WHO policy update

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In 20201, WHO issued a recommendation for use of computer aided detection (CAD) for CXR interpretation for TB screening, to enable implementation and scaleup of TB screening beyond what is possible with radiologists alone. Since then, there has been a proliferation of new CAD products and versions. In January 2025 WHO held a technical advisory group meeting to evaluate the current class of CAD products.
To enable this, FIND conducted an independent evaluation of diagnostic accuracy using two large, globally representative CXR libraries. Here we present the results of this evaluation and its implications for global policy for CAD.

Advances and challenges in AI-based cough analysis for TB screening

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Cough is a common symptom of pulmonary tuberculosis (TB), sparking interest in its potential as a biomarker for novel screening approaches. Recent advances in artificial intelligence and digital health have enabled researchers to explore the potential of algorithms capable of analyzing cough acoustics for TB detection. This non-invasive methodology has garnered attention due to its accessibility and ease of data collection across diverse settings. However, critical challenges regarding algorithm performance, validation, and real-world implementation remain underexplored.
This presentation examines developments in digital cough sound analysis for TB screening, evaluating technical capabilities, preliminary clinical findings, and implementation feasibility.

Leveraging oral swab-based molecular diagnostics for scalable TB detection

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Timely TB detection is critical to reducing transmission and mortality, yet nearly one-third of global TB cases remain undiagnosed annually. The World Health Organization advocates systematic screening in high-risk populations, but current tests face limitations in reach, accuracy, and cost, hindering scalable community-based active case finding (ACF). The expansion of molecular diagnostics during COVID-19 presents an opportunity to enhance TB screening using oral swabs as a non-invasive, accessible and accurate sampling method.
This presentation explores the potential of oral swabs for TB screening, their role in improving diagnostic efficiency, and their integration into ACF strategies in high-burden settings.

SY19-290-19 Emerging data in maternal and infant TB

Chair: Nicole Salazar-Austin, Johns Hopkins University School of Medicine, Department of Paediatrics, Baltimore, United States
Chair: Emma Kalk, University of Cape Town, Cape Town, South Africa

Owing to increased advocacy around the inclusion of pregnant women in research (and experiences around SARS-Co-V2 infection and vaccination) there has been increased prominence given to clinical and pharmaceutical studies during pregnancy, both in terms of the impact of disease and therapeutics on pregnant women and fetuses; and the longer term impact of antenatal exposures on infants and children. The increased risk of TB diagnosis during pregnancy and the postpartum period and the poor outcomes associated with untreated maternal disease have led to increased interest in antenatal screening and diagnosis of TB.
This Symposium will showcase recent TB research outputs across the maternal and neonatal care continuum and beyond. We have included both basic and applied, qualitative and quantitative studies from global sites engaged in maternal TB research.

Emerging data on TB prevention in pregnancy: Where do we go from here?

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For women, the risk of TB is highest during and immediately after pregnancy. Maternal TB results in adverse maternal, pregnancy and infant outcomes. Yet, there is no global consensus on how best to prevent TB during pregnancy.
In this talk, we will review existing data on TB prevention regimens in pregnancy and while breastfeeding. This will include a detailed review of new short-course rifapentine-containing regimens, including 1HP and 3HP, from clinical trials including DOLPHIN Moms and IMPAACT 2001.

Population pharmacokinetic modelling of second-line TB drugs in pregnancy and lactation: Insights from levofloxacin and delamanid

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Pregnant and breastfeeding women have historically been excluded from tuberculosis drug trials, resulting in limited pharmacokinetic data to guide dosing of tuberculosis drugs in these populations. Using mathematical modelling, we aim to bridge this gap by characterizing the pharmacokinetics of key second-line drugs during pregnancy and lactation. We apply nonlinear mixed-effects modelling to evaluate the impact of physiological changes in pregnancy and postpartum on drug disposition, using limited but rich datasets from South African trials of rifampicin-resistant tuberculosis.
We will share findings on levofloxacin and emerging data on delamanid, including penetration into breastmilk and infant exposure.

Impact of pregnancy on TB treatment outcomes: An analysis of national surveillance data

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In most settings, pregnancy is not routinely captured in TB reporting and little is known about its impact on TB treatment outcomes. This presentation will describe surveillance data from Brazil's Ministry of Health including 96,868 women 11-49 years old, newly diagnosed with drug-susceptible TB disease between 2016-2022 who had a known treatment outcome. Among 1870 pregnancies, pregnancy was associated with unfavorable TB outcomes differentially by age with adolescents having a higher odds of loss to follow-up and death, women aged 20-39 years having a higher loss to follow-up, and women aged 40-49 years having a higher risk of death.

Radiant-Moms: Generating evidence to support the evaluation, adoption, and safe practical implementation of novel TB treatment regimens for pregnant and lactating women

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The Radiant-Moms study aims to examine preferences among pregnant and breastfeeding women and their healthcare providers regarding novel shorter TB treatment regimens during the pregnancy and postpartum periods.
In phase one, we qualitatively explore these preferences through in-depth interviews with key stakeholders, including community influencers, pregnant and breastfeeding women, and South African and Filipino providers.
This novel group of participants reported that pregnant and breastfeeding women would largely be interested in participating in TB clinical trials and highlighted the importance of a family-centered approach to TB treatment so that all household members have access to the same treatment regimen.

Integrating TB care with maternal and child health: Lessons learned in Papua New Guinea

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Port Moresby General Hospital maternal and newborn division cares for >15,000 deliveries annually. TB is the leading infectious cause of maternal mortality at PMGH. Historical data shows approximately 50 pregnant women and 30 infants <6 months old diagnosed with TB annually. Pregnant and postpartum women are a priority group for TB screening by PNG NTP and WHO. Our TB Free PNG program supported by TB Reach, supports TB screening, the use of chest radiography with AI reading, TB treatment and linkage to care for women and TB case finding and preventive treatment in their newborns and families.

SY20-300-20 Impact of recent and expected reductions in international donor funding for TB prevention and care

Chair: Jeremiah Chakaya, Respiratory Society of Kenya and Kenya Medical Research Institute, Nairobi, Kenya
Chair: Katherine C. Horton, London School of Hygiene and Tropical Medicine, London, United Kingdom

Contributions from the United States typically account for half of all donor funding to tuberculosis prevention, diagnostic, and treatment services. Earlier this year, the US dismantled USAID, abruptly ending much of this support, and a number of other donor countries have announced reductions in contributions to bilateral aid programmes and multinational organisations. These funding cuts threaten to reverse decades of progress to reduce tuberculosis morbidity and mortality.
This session offers community and policy perspectives on the impact of funding cuts; presents the projected epidemiological impact of cuts in TB and HIV funding; and discusses mitigation strategies and ways forward.

Impact of US government funding halt on TB responses in high-burden TB countries

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The US Government funding halt, particularly through USAID, has significantly disrupted tuberculosis (TB) response efforts in several high TB burden countries. This presentation presents results from the Stop TB Partnership's work outlining the key areas of disruption, the specific impacts on TB programmes, and the mitigation measures being implemented or planned to address these challenges.
The presentation is structured around the broad areas of work affected, including TB screening, diagnosis, treatment, prevention, community-led activities, private sector engagement, monitoring and evaluation, supply chain management, operational research, technical assistance, capacity building, and other critical activities.

Community perspectives on the impact of funding cuts in South Africa

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Funding cuts are hitting communities hard, especially in healthcare and TB services. In this session, I will talk about how these cuts affect access to treatment, patient support, and advocacy in South Africa. I will share real experiences, highlight key challenges, and show why sustainable funding is essential. We need to listen to those most affected and push for change to protect vital services.

Predicting the epidemiological impact of TB funding cuts in low- and middle-income countries

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Tuberculosis prevention, diagnostic, and treatment services in many settings rely heavily on international donor funding. In this presentation, I will discuss results from our work modelling the impact of reductions in international donor funding on the tuberculosis burden in 79 low- and middle-income countries. We estimated substantial direct impacts of funding cuts on tuberculosis morbidity and mortality, particularly in the WHO African Region and low-income countries.

Predicting the epidemiological impact of HIV and TB funding cuts on TB in South Africa

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This presentation describes a South African-led modelling exercise to predict the potential impact of recent USAID/PEPFAR funding cuts on HIV and TB in South Africa. This is based on analyses of past US spending on different components of the HIV and TB programmes. We assess the impact of proportionally reducing the coverage of different HIV and TB services using the Thembisa model, which fully integrates HIV and TB.
In South Africa, where most incident TB is due to HIV, we predict much of the impact of the funding cuts on TB will be exacerbated by disruptions to HIV services.

Reckoning with the roots of TB's funding crisis

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This presentation investigates how systemic failures—far predating recent funding cuts—created today's crisis. Through Pakistan's experience, we examine how chronic underinvestment, donor-centric models, and fragmented governance institutionalized dependency while eroding resilience. True accountability requires confronting these structural roots to break the cycle—and to forge a new one. We explore pathways forward: domestic resource mobilization, equitable global partnerships with meaningful local leadership, and community-led governance mechanisms.
This session challenges participants to transform understanding into action—because diagnosing why systems fail is only the first step toward building lasting solutions.

SY21-310-21 Investment case: Why community engagement is critical to ending TB

Chair: Tauhid Islam, Global Tuberculosis Programme – WHO, Geneva, Switzerland
Chair: Nimalan Arinaminpathy, World Health Organization TB Monitoring, Evaluation & Strategic Information, Geneva, Switzerland

This symposium will present the emerging investment case for community engagement (CE) in national TB responses. While CE is widely acknowledged as essential to people-centered TB care, its full potential remains underfunded and underleveraged. Drawing on new evidence from a global scoping review, financial modeling, and expert consultations, the session will explore how different types of community participation contribute to improved TB outcomes, and how these efforts can be costed and sustained.
The symposium aims to deepen understanding of CE's impact on resilient health systems, and to provide actionable recommendations for integrating CE into national strategic plans and TB financing frameworks. Participants will leave with evidence-informed arguments to support greater investment in CE, tailored to diverse policy and programmatic contexts.

Community engagement for ending TB: Why it matters and what it takes

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This presentation will introduce the WHO Guidance on the engagement of communities and civil society to end TB as the normative backbone of the investment case. It will outline the strategic roles of communities across the TB response and emphasize how the guidance articulates the why, what, and how of meaningful engagement.
By linking principles such as co-creation, accountability, and sustainability to financing and implementation, this talk will establish the case for moving from political commitment to concrete investment in community-led action.

Making it count: Evidence of impact from community engagement in national responses

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Community engagement (CE) is widely endorsed in TB programming, yet evidence of its impact remains uneven and under-theorised. CE encompasses a wide range of practices—from consultation and co-production to instrumentalised support—raising questions what type of engagement serves programmes best.
Finally, pathways linking CE to improved TB outcomes remain unclear. A realist review can uncover these complexities by asking: what works, for whom, in what contexts, and how—yielding insights to inform more equitable and effective TB responses.

Insights from a scoping review: Understanding how community engagement drives TB outcomes

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Based on a realist-informed scoping review of over 180 studies, this presentation will explore how and why community engagement contributes to improved TB outcomes across diverse contexts. It will examine the mechanisms—such as trust-building, peer-led support, and community-led monitoring—that enable interventions to succeed.
The presentation will also highlight how factors like local ownership, stigma reduction, and responsiveness to community needs influence effectiveness. These insights help clarify not just whether, but how and under what conditions community engagement improves access, quality, and equity in TB services.

Modeling the health and economic impact of community engagement in TB

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This presentation will share results from epidemiological modeling that estimates the potential impact of CE on incidence and mortality, and its return on investment. It will highlight illustrative scenarios showing how CE can enhance treatment completion and case detection, and reduce mortality.
The session will also explore future modeling directions, including assessing catastrophic cost reduction, stigma mitigation, and improved equity. These data aim to inform policymakers and funders seeking to make smart, evidence-based investments in community-driven TB strategies?

SY22-320-22 Charting the course of post-TB lung health and well-being: Advances and opportunities in the field

Chair: Marieke van der Zalm, Stellenbosch University, Cape Town, South Africa
Chair: Stellah Mpagama, Kibong'oto Infectious Diseases Hospital, Siha, Tanzania

This symposium explores emerging evidence and priorities in post-tuberculosis lung health and well-being, spanning children, adolescents, and adults. It highlights progress in characterising the early natural history of post-TB lung disease (PTLD), refining research definitions, and integrating survivor voices through community engagement and advocacy. Advances in paediatric PTLD research will be shared, alongside adolescent and adult perspectives, emphasising the need for age-appropriate approaches and data.
By bringing together research, clinical, and community viewpoints, the session aims to inform ongoing discussions on clinical management, policy development, and equitable care for TB survivors across the life course.

Advocacy priorities for post-TB care

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This session will highlight advocacy priorities for post-TB care, with a focus on community engagement and survivor-led action. Drawing on key conclusions from the advocacy working group at the 3rd International Post-TB Symposium, the session will expand on strategies to elevate the voices of TB survivors, promote equitable access to post-TB care, and integrate long-term health and well-being into TB programmes. Phumeza will reflect on experiences from diverse settings and discuss how advocacy can drive research, policy, and service delivery.
The session aims to build momentum for a global, inclusive approach to addressing the lasting impact of TB.

Global consensus on PTLD: A research-focused definition for children, adolescents, and adults

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A globally representative group of post-TB lung disease (PTLD) experts has collaboratively developed a research-focused definition of PTLD to support standardised data collection across PTLD studies involving children, adolescents, and adults.
This initiative was first presented during at the 2nd International Post-TB Symposium in Stellenbosch, and has since evolved into a manuscript, targeted for submission in April 2025. Contributors include experts from diverse regions and disciplines, reflecting broad clinical and research expertise across the life-course.
The proposed definition and reporting framework aim to harmonise PTLD research efforts globally and improve the synthesis of evidence in this complex and growing field.

Adolescent post-TB lung disease: Emerging evidence

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This presentation will review data on adolescent post-TB lung disease (PTLD), focusing on a new study conducted in Lima, Peru. While PTLD is increasingly recognised in adults, data specific to adolescents remain limited, despite their distinct developmental and healthcare needs.
This presentation will highlight research strategies and priorities to better understand PTLD in this critical age group.

Advancing post-TB care through individual participant data meta-analysis

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Epidemiology provides essential tools to understand the long-term consequences of tuberculosis, yet critical gaps remain in our knowledge of post-TB health.
This presentation will highlight how individual participant data meta-analysis (IPD-MA), grounded in rigorous epidemiologic methods and thoughtful study design, can help advance our understanding of post-TB respiratory sequalae. We will demonstrate how global data can be used to estimate prevalence in key subgroups, identify

epidemiological determinants of post-TB outcomes, and develop risk prediction models to guide clinical decision-making.
This work aims to generate actionable evidence to support more targeted, equitable care for people affected by TB.

Understanding the early natural history of post-TB lung disease: Insights from the TB aftermath study

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This presentation will summarize key lung health findings from the TB Aftermath study including:
1. Burden, clinical presentation and severity of post-tuberculosis lung disease (PTLD) among successfully treated individuals with pulmonary and extra-pulmonary tuberculosis;
2. Phenotypes of PTLD and their evolution during post-treatment follow-up;
3. Feasibility of performing de-centralized point-of-care spirometry at outpatient respiratory clinics in a programmatic setting, and in the TB affected communities;
4. Performance of a simple point-of-care case finding tool for PTLD screening/triage.
Taken together, the presentation aims to characterize the early natural history of PTLD and meaningfully contribute to ongoing clinical and policy discussions.

SY23-330-23 Beyond explanatory phase III adult trials: Innovative TB treatment trials for effectiveness in programmatic settings and inclusion of priority populations

Chair: Geraint (Gerry) Davies, University of Liverpool, Liverpool, United Kingdom
Chair: Tiziana Masini, World Health Organization, Geneva, Switzerland

Challenges such as treatment complexity, adherence difficulties, and poor tolerability, highlight the need for high-quality, pragmatic evidence to new international recommendations and optimize uptake in programmatic settings. Moreover, exclusion of specific populations from adult trials (pregnant and lactating women, adolescents) and delay in paediatric development result in lack of or late access to latest available innovations for many of the most vulnerable people affected by TB.
The symposium will provide insights on how to optimize the TB clinical trial landscape, to reflect on how to fill the gap between evidence generated in explanatory efficacy studies in adults, and its integration into global and national policies and implementation across all relevant populations.

Country-led, collaborative platform for clinical trials of TB: A paradigm shift in TB research

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Pragmatic, streamlined clinical trials have proven effective in generating large-scale, high-quality evidence quickly and cost-efficiently—most notably for COVID-19 and other diseases. Applying these methods to tuberculosis (TB) presents a major opportunity to improve the evidence base for global treatment guidelines.
In this session, Dr. Schumacher will present the rationale for rethinking late-stage trials of licensed TB medicines, discuss key methodological shifts needed, and introduce plans for a WHO-facilitated trial platform designed to support direct collaboration among high-TB burden countries.

A platform approach for phase I/II trials of new TB drugs in children

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Platform trials are innovative approaches to reduce the significant lag between adult and pediatric approvals by providing clarity regarding trial design and necessary investment in trial sites and ideally be embedded in the public health systems.
As efficacy can generally be extrapolated from adults to children, platform trials would include a master protocol and compound-specific protocols for single-arm trials to assess pharmacokinetics, safety, and tolerability of the individual compounds of a novel regimen; in some cases, this will obviate the need to study different regimens in children. Quality systems, data standardization and governance will also need to be addressed.

Strategy trials in children: Reflecting on the need for randomised, controlled efficacy trials in children

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As children with most forms of TB respond as well or better to TB treatment compared to adults, it is reasonable to extrapolate efficacy of TB drugs and regimens from adult trials to children. Therefore, the priorities for many paediatric trials are pharmacokinetics, dose, safety and acceptability. However, there remains an important place for efficacy trials in children to establish when they may be effectively treated with shorter treatment durations or fewer drugs, as in the SHINE trial. This presentation will outline the rationale for strategy trials in children, describe approaches to design, and share examples of planned trials.

Inclusion of pregnant women in clinical trials

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For women, the highest risk time to develop active TB is during and immediately after pregnancy. Maternal TB leads to adverse pregnancy and infant outcomes. Despite these epidemiologic facts, pregnant and lactating women continue to be excluded from the majority of TB treatment and prevention trials.
In this talk, Dr. Mathad will discuss new approaches to early and optimal inclusion of pregnant and lactating women in TB drug and vaccine research, based on the recent WHO-convened TB pregnancy consensus project.

Beyond efficacy and safety: The importance of person-centred outcomes

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This presentation will discuss recent work to develop outcomes which can be routinely used in TB treatment and prevention studies to measure experiences that are important to people facing TB. Examples include quality of life, treatment tolerability, ease of administration, fewer low grade AEs, acceptability, that might not reach thresholds to be considered important events from clinical view but critically important from a TB person' s affected perspective.

SY24-340-24 Unveiling TB narratives: The power of storytelling

Chair: Petra Heitkamp, McGill University Health Center, Research Institute, Ottawa, Canada
Chair: Lindsay Palazuelos, Partners In Health, Boston, United States

Four dynamic women authors converge to unveil the untold stories of tuberculosis. This symposium provides practical guidance on the intersection of science communication and storytelling. Through provocative discussions and brief exercises the audience will learn how to amplify the voices of those affected by TB, and master techniques in writing that provoke thought and rouse one to action. If location allows, break-out groups will be organized.
This session focuses on key aspects of storytelling–science communications, narrative arc, and structure to elevate the voice of people affected by TB and reach the widest possible audience. Sharp and incisive writing has the power to create much-needed conversation around important events and public health issues. Participants will leave the session equipped with insights into the importance of storytelling in TB advocacy, practical techniques for crafting impactful narratives, and the tools to sharpen their voices in addressing this global health challenge.

Techniques in writing and storytelling for targeted impact

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Effective Techniques in Writing and Storytelling for Reaching Relevant Audiences and Strategies for Provoking Thought and Spurring Action through Sharp and Incisive Writing. The presentation will be followed by an interactive exercise for all participants.

Beyond the data: The Art of storytelling in science communication

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In this interactive workshop, we will explore the intersection of storytelling and science communication. While data and facts are essential, the most impactful science stories are those that resonate on a human level.
Through a blend of practical exercises and thought-provoking discussions, participants will learn how to transform complex scientific concepts into compelling narratives that engage, educate, and inspire diverse audiences. From crafting relatable stories to enhancing clarity and emotional connection, this workshop will introduce you to the tools for communicating science in a way that goes beyond numbers and data points and speaks to the heart of your listeners.

Framing narratives to empower those affected by TB and directing voices to build empathy and influence decisions

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Building on the previous speaker, Handaa outlines how we can frame narratives to empower those affected by TB. Her presentation outlines various aspects on directing voices to build empathy and compassion while aiming to influence decisions of policymakers.

SY25-350-25 Implementation research to prepare for the introduction of new TB vaccines for adults and adolescents

Chair: Saskia Den Boon, World Health Organization, Geneva, Switzerland
Chair: Vanessa Veronese, Special Programme for Research and Training in Tropical Diseases, Switzerland

This symposium will explore the critical role of implementation research in the successful introduction of new TB vaccines for adults and adolescents. Presentations will cover key outstanding evidence needs, willingness to receive new TB vaccines in Mozambique, an exploration of strategies to integrate novel TB vaccines with other existing health services in South Africa, and health economic modelling in India. We will also learn about the role of civil society and affected communities in translating political commitments into action to deliver new TB vaccines.
Attendees will gain valuable insights into the practical challenges and solutions for vaccine introduction, addressing evidence gaps through targeted implementation research, learn about the research methodologies to address these evidence gaps and challenges, and understand the importance of early preparation.
This session is essential for those dedicated to the effective and equitable rollout of new TB vaccines for adults and adolescents.

Gavi's Investment Case and Learning Agenda for new TB Vaccines

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Gavi will present its investment case which signalled in-principle support for future new TB vaccines for adults and adolescents. The presentation will outline priority areas for a learning agenda addressing key evidence gaps, including delivery strategies for the new adolescent immunisation touchpoint, integration with existing immunisation and TB intervention pathways, and understanding acceptability.

Evaluation of the acceptability of new and repurposed tuberculosis vaccines in southern Mozambique

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New TB vaccines for adolescents and adults offer a vital opportunity to reduce TB burden in high-incidence settings like Mozambique, where most vaccines target only young children. Barriers such as long distances to health facilities, vaccine shortages, and limited vaccine availability hinder coverage. Additionally, local beliefs about TB influence risk perception. Understanding community attitudes toward new vaccines is essential for effective introduction and equitable access.
In this presentation, we will share data on the willingness of adolescents, adults, and their caregivers to receive a new TB vaccine or BCG booster, providing insights to inform future vaccine introduction efforts.

Integrated model of delivery for novel TB vaccines in South Africa

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Adolescents and adults should be targets of novel TB vaccination for the greatest impact. Globally, experience in delivering vaccines to these populations is limited. Novel TB vaccines delivery through campaigns without integration to other health services will increase costs for the program and might not be sustainable or reach the heterogeneous populations that may benefit from the TB vaccines.
In this talk we will present data from literature review and participatory workshops with key stakeholders on strategies to integrate novel TB vaccines with other existing health services, including but not limited to primary healthcare clinics, schools and occupational health services

Optimizing TB Vaccine Strategies: Harnessing Local Evidence and Modeling Insights in the Indian context

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In resource limited settings like India, vaccine deployment strategies enabling maximal impact and cost-effectiveness are critical for timely policy decisions. Early understanding of priorities - who, what, why, how, when – can help optimize national efforts.
We present an integrated and responsive in-country model from India which is leveraging country-specific insights – target population, priority delivery scenarios, programmatic feasibility and integration, and end-user acceptability - to predict most impactful strategies. Aligning local evidence such as national level data, stakeholder insights, and programmatic lessons including from BCG revaccination would be key for shaping policy pathways and ensuring country preparedness.

Advocacy for policy impact: translating political commitments to action to deliver new TB vaccines

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Civil society and affected communities play essential roles in translating political commitments to develop and deliver new TB vaccines into reality. This includes calls for context-specific approaches and multilateral collaboration to maximize impact. This speaker will present on the work of the TB Vaccine Advocacy Roadmap in advocating for novel financing and access models for TB vaccine development and delivery.
Reflections will also be shared on global campaigns in support of this effort and community-led demands for inclusive and equitable research and implementation outlined in the Community Declaration of the 7th Global Forum on TB Vaccines in October 2024.

SY26-360-26 A world without TB must not be a world without ethics: The AI dilemma

Chair: Razia Kaniz Fatima, UNOPS Consultant TB technical assistance TB strategic planning and Global Fund Grants, Islamabad, Pakistan
Chair: Nesri Padayatchi, CAPRISA, University of Kwa ulu Natal, Durban, South Africa

As the TB community works towards a 'World without TB', by pioneering new technology, finding new drugs and fostering partnerships, let us uphold the most critical partner in this fight, the person with TB! Health disparities over access to new drugs and technologies require a review, revival, and a reminder of ethics. As we innovate, we need to continue looking forward. Artificial intelligence (AI) could be the key to creating first-of-a-kind solutions, OR NOT. The usefulness of AI in TB diagnostics has generated enthusiasm to accelerate this technology into other areas of TB care and prevention.
This session will provide a forum for discussions around AI and ethics in health, specifically populations affected by TB. Given the climate-related consequences and monetary costs of using AI, we must resist being seduced by new tools just because they're new or just because they're being used elsewhere in medicine.

Ethical considerations in ultrashort TPT trials

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Tuberculosis preventive treatment (TPT) is one tool in the TB elimination toolbox, and is offered to those with presumptive TB infection to prevent disease. While though the duration of TPT has been shortened, uptake remains low.
This presentation will highlight ethical considerations around the investigation of ultra-short course TB preventive therapy with the aim of identifying the optimal trade-off between efficacy and acceptability.

The ethics of artificial intelligence in health

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The doctor-patient relationship is steeped in tradition, all of which are poised for disruption by digitization, emerging technologies and AI. The transition to electronic health records (EHRs), wearables, etc. has created new possibilities to scale up data collection to unprecedented

levels. While innovation will improve TB care and prevention, we ought to be mindful of the ethical, legal and social challenges. Global guidelines are emerging to ensure governance in AI but many low-and middle-income countries are yet to adapt and contextualise these frameworks. This talk will focus on the ethical principles of relevance of AI as outlined in WHO guidelines.

AI in TB care: Just because the cool kids are doing it doesn't mean you have to do it too

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In order to be of use, we should be clear what question we're trying to answer using AI and whether AI is better or more efficient at answering that question than the current standard. Even if there is a question for which AI is useful (e.g. diagnostics) we should ask whether it will lead to better outcomes (e.g. is diagnosis the main barrier within the cascade of TB care?).
I will outline some ethical challenges related to adopting AI in a historical and present-day context that has failed to address the socioeconomic and political determinants of TB infection and disease.

Perceptions of TB-affected communities about AI in TB care

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AI is being widely launched in healthcare, including TB. Traditionally, persons with TB (PwTB) prefer the human element in their TB care. For example, digital adherence tools were promoted widely, but evidence suggests PwTB still prefer healthcare workers to guide them through their treatment. In light of accelerating AI use in TB care, this session will focus on how beneficiaries perceive AI.
We will discuss questions like - Are PwTB aware of AI or understand how it works in TB care? Any concerns regarding quality of care they receive? Do PWTB have any right to say no to AI-enabled care?

SY27-370-27 Bridging the gap: Accelerating development and approval of priority formulations for children with TB

Chair: Anneke C. Hesseling, Desmond Tutu TB Centre, Stellenbosch University, Cape Town, SY27-370-27
Chair: Catherine Hewison, Médecins Sans Frontières, Paris, France

Paediatric tuberculosis formulation development and investigation should begin while phase II/III trials are underway in adults. However, the development of tuberculosis medicines for children still dramatically lags behind that for adults mainly due to limited investments and market incentives. With novel compounds in the tuberculosis drug pipeline moving into late-phase clinical evaluation in adults, there is now momentum to accelerate paediatric trials and approvals of priority tuberculosis medicines to ensure that children can benefit more rapidly from latest therapeutic innovations.
This symposium will share emerging innovative approaches to streamline paediatric studies, from designing and implementing more efficient trials through a paediatric research platform, and state-of-the-art pharmacometrics approaches, to accelerating their approval, building capacity for clinical trials, with specific needs of children and adolescents.
We will present ganfeborole as a case study demonstrating how global cross-cutting collaboration in the paediatric research community can help accelerate tuberculosis drug development in children.

CHasing Expedited and Equitable Treatment Access (CHEETA) for children

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There have been 8–13-year delays between when new TB drugs have been approved for use in adults and when pediatric trials of those drugs have been completed across the age spectrum. This results in preventable morbidity and mortality in children. As a growing pipeline of exciting new TB compounds moves through adult studies, these delays are expected to continue without innovative new approaches.
This presentation will describe critical sources of delays in pediatric trials of new TB drugs and crosscutting solutions of the CHEETA Consortium and other key stakeholders to speed pediatric evaluations of new TB drugs.

State-of-the-art pharmacometric approaches to paediatric trials

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Pharmacometric modeling is a powerful tool to accelerate pediatric anti-TB drug development. The presentation will showcase how pharmacometrics can be used to select minimal sampling schedules and number of participants, and to inform trial formulation and dosing. The use of modeling for interim and final analysis, as well as for the generation for practically implementable dosing schedules will also be discussed.
Lastly the impact on global dosing guidance will be demonstrated by the example of how bedaquiline dosing for children <6years made it into WHO Operational handbook.

Child-friendly formulations and acceptability: Not an afterthought

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Historically, the lack of child-friendly formulations of TB medicines has limited access to treatment for children. Manipulation of adult formulations may result in inaccurate dosing, and they may be unpalatable and unacceptable to children and caregivers. While currently used TB medicines are available in child-friendly formulations, we have a unique opportunity to ensure prompt availability of paediatric formulations for medicines that are still being investigated.
This presentation will reflect on strategies to ensure prompt availability of suitable formulations for children, and will provide insights on bridging strategies that can be implemented not to delay access to new therapeutics for children.

Towards regulatory approval: Paediatric investigation plans

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The presentation will address the current requirements for the approval of TB medicines for children in the EU, including the need and scientific contents of paediatric investigation plans (e.g. population, type of study designs, context of use of extrapolation) and the opportunities for developers to interact with regulatory authorities across the whole lifecycle of development of paediatric TB medicines.
The talk will also touch upon international regulatory initiatives and collaborations supporting the availability of paediatric TB medicines in other geographic areas of the world.

SY28-380-28 Global political and financial shifts: Impact on TB communities and a collective action response

Chair: Petra Heitkamp, McGill University Health Center, Research Institute, Ottawa, Canada

Abrupt U.S. funding cuts have put the health infrastructure in many countries with a high burden of TB at risk. Health systems and lives are impacted, with frontline organizations and staff stopping their life saving work and millions more people being projected to fall ill from and die of TB. To document the impacts of the stop-work order and funding freezes on TB programs and partners, and to mobilize action and resources, the TB Community Coordination Hub - a volunteer initiative launched in response to the crisis - ran a TB-specific impact survey from February 11 - 24, 2025.
This session will share findings from the survey, in-depth case examples of impacts of US funding withdrawals from three countries, and overarching experiences and lessons learned from this community effort to mobilize and coordinate an organized community response during this time of crisis.

Assessing the USAID fallout: Comprehensive survey insights on TB programme impacts

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This presentation will explore the impacts of USAID's abrupt stop work orders and funding terminations on global TB response efforts. It will provide an overview of the challenges and setbacks faced by TB programs worldwide, documented through a TB-specific impact survey conducted by the TB Community Coordination Hub. The presentation will highlight key findings, showcasing the severe disruptions in TB services across various countries.
Through data-driven insights the presentation aims to share findings from the survey and underscore the urgent need for robust and sustainable TB financing solutions, and to foster a collaborative dialogue on how to mitigate disruptions.

TB lives disrupted: The human cost of interrupted support in Ukraine

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In this presentation, Olya draws on the experience from Ukraine and other countries to explain how the consequences of funding cuts are real and deeply personal. Individuals face treatment interruptions due to medicine shortages, the absence of psychosocial support, and reduced availability of community-based services. Stigma compounds the problem — people are avoiding TB centers for fear of being seen, while others are forced into impossible choices. Olya explains how when people are left behind, TB doesn't just affect them — it threatens the broader community. The long-term impact of disruptions will cause rising transmission and worsening health outcomes for people.

TB Healthcare workers furloughed: The impact and experience in Cambodia

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The community health workers who have ensured the delivery of TB services until now have been sent home, either furloughed or fired. In this presentation, Chamreun shares the experience from Cambodia and his organization, where hundreds of front line healthcare workers have lost their jobs. In just two months, this resulted in a 66% decrease in TB case notifications. Hundreds of people sick with TB are now going undiagnosed and not able to start treatment and the dedicated staff, often choosing the work for the purpose first, are now seeking to find employment to make a living.

TB Programmes in distress: Experiences from Kenya

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National programs are hard pressed to replace the funding cuts. Choices are being made in what services get priority and what gets cut. In this presentation, Evaline shares experiences from Kenya, revealing how services are being prioritized and what the impact on the overall TB response in the country is. All essential services, including identifying persons at risk of TB (screening, transport and testing sputum specimens), enrolling people affected by TB on the correct treatment regimen (including preventive treatment), supporting people to adhere to and complete their treatment (including mental health and nutrition), and more have been impacted.

TB Community Coordination Hub: The TB community takes collective action to lead a response in crisis

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In response to the crisis of U.S. stop work orders, the TB Community Coordination Hub was resurrected to support the development of an informed and organized community response.
In this session you learn more about how and why the Hub was mobilized, and Robyn will explore key lessons learned, challenges, and the value-add of an independent community led coordination platform. Should the work of the Hub be sustained or replicated in the future, this presentation will set the community up for success. The presentation and session will close with calls to action from the community still in need of attention.

SY29-390-29 Addressing TB in migrant populations: Challenges, evidence, and strategies for action

Chair: Delia Goletti, National Institute for Infectious Diseases-IRCCS L. Spallanzani, Italy
Chair: Daria Podlekareva, International Reference Laboratory of mycobacteriology (IRLM), Statens Serum Institut, Department of Respiratory- and Infectious Diseases, Copenhagen University Hospital - Bispebjerg, Centre of Excellence for Health, Immunity and Infections (CHIP) Copenhagen University Hospital – Rigshospitalet, Copenhagen, Denmark

Background and Rationale: Migrant populations, including labor migrants, asylum seekers, and refugees, face a disproportionate burden of tuberculosis (TB). Social determinants such as poor living conditions, barriers to healthcare access, and legal constraints contribute to increased vulnerability. Despite global commitments to TB elimination, gaps remain in screening, prevention, and treatment tailored to these populations.
This symposium will provide a comprehensive overview of the latest evidence, best practices, and policy considerations in addressing TB among migrants.
Objectives:
* Discuss the epidemiology and burden of TB among migrants, including subpopulations with increased risk.
* Discuss TB screening, prevention, and care models tailored to migrant communities.
* Explore the challenges of ensuring equitable TB services for refugees and asylum seekers, drawing on international experiences.
* Identify policy and programmatic solutions to improve TB outcomes in migrant populations.
* Present findings from the consensus on TB management in migrant populations.

Overview of TB in migrant populations: Epidemiology and barriers to care

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An overview of the global burden of tuberculosis among migrant populations, often facing higher risks due to socioeconomic vulnerability and limited access to healthcare.
We will examine **structural and systemic barriers** (restrictive policies, stigma, language/cultural challenges), **that hinder timely TB diagnosis and treatment.**
Emphasis will be placed on **strategies to improve access to TB services** (inclusive health policies, culturally appropriate services, cross-sector collaboration).

Addressing TB in migrant populations is essential for both equity and effective TB control, requiring coordinated efforts across public health, policy, and community engagement.

Re-emergence of drug-resistant TB because of instable geopolitics

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Internally displaced populations (IDPs) are the most vulnerable and neglected. We explore the re-emergence of DR-TB in the context of unstable geopolitics and population displacement. Armed conflict, political crises, and natural disasters disrupt health systems, leading to interrupted TB-treatment and rising antimicrobial resistance. Migrants, refugees, and IDPs face immense barriers to care across borders—from loss of medical records to lack of legal status.
We discuss key challenges in maintaining treatment continuity and present strategies such as cross-border referral systems, mobile health interventions, and policy frameworks that prioritize TB-care in emergencies, with a focus on reaching the most vulnerable populations.

TB and refugees: Challenges and solutions from a global perspective

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Talk addresses the complex interplay between tuberculosis and refugee health. It identifies unique challenges faced by refugee populations, such as limited access to healthcare, overcrowded living conditions, and disrupted treatment regimens. We explore effective screening strategies tailored to refugee camps and host countries, emphasizing early detection and prevention as well as addressing cross-cultural and language barriers.
Additionally, it will discuss innovative treatment solutions that consider the mobility and resource constraints of refugee settings. By sharing global perspectives and best practices, the talk enhances collaboration among healthcare providers, policymakers, and humanitarian organizations to improve TB control and care for refugees worldwide.

Consensus-based recommendations for TB prevention and care in migrants

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This talk presents key findings from the recently submitted consensus-based recommendations for tuberculosis control in migrant populations. Developed through expert collaboration, the consensus outlines critical gaps and priorities in addressing TB among migrants, emphasizing equity, continuity of care, and culturally competent services. We will review key policy and clinical practice recommendations, including access to screening, diagnosis, and uninterrupted treatment regardless of legal status.
Finally, we'll explore strategies for implementation at both regional and global levels—such as harmonized protocols, cross-border coordination, and stakeholder engagement—to ensure these recommendations translate into impactful, sustainable action across diverse healthcare settings.

SY30-400-30 Accelerating the introduction of new sample types and near point of care platforms to close gaps in TB diagnosis

Chair: Nazir Ismail, Wits University, Johannesburg, South Africa
Chair: Tejaswini Dharmapuri Vachaspathi, Treatment Action Group, New York, United States

The limits of existing low complexity rapid molecular tests and continued reliance on sputum directly contribute to the TB testing gap, estimated to be 2.7 million people in 2023. The TB diagnostic product pipeline contains promising tools with the potential to improve TB case detection using new sampling techniques, such as oral swabs, and near point-of-care (POC) tests, which are expected to undergo WHO review in the latter-half of 2025.
Early planning for introduction of new sample types and platforms, including discussions on how they can be introduced into current national diagnostic networks and complement existing infrastructure and fill gaps, is essential.
This session will give an overview of emerging technologies to detect TB using oral swabs at the near point-of-care. Speakers will highlight results from studies evaluating these tools, considerations on preferences and acceptability, and trade-offs and opportunities that may inform uptake and implementation.

Performance of tools in the pipeline using oral swabs for TB detection

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Tools in the TB diagnostics pipeline that use oral swabs and can be placed near the point of care have the potential to transform TB detection.
This presentation will provide an overview of these tools, how they perform compared to traditional sputum-based methods in terms of diagnostic accuracy and yield, and what further research is needed to inform introduction and uptake.

Trade-offs and considerations: Sample types and placement

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Trade-offs between accuracy, accessibility, and placement need to be carefully considered before integrating oral swab-based diagnostic tools into existing TB diagnostics networks and algorithms. Some of the trade-offs and other considerations that will be explored in this presentation include: diagnostic accuracy vs. yield; technical limitations of tools designed for decentralized settings, including integration of drug-sensitivity testing; and the preferences of end-users and how their views on trade-offs can be better captured in preference surveys and discrete choice experiments designed to inform product development and introduction.

The Global Fund next-generation market shaping strategic initiative: Early demand estimations for near-point of care tests to support affordable access to new TB diagnostics

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With several diagnostic products in the late-stages of development, the Global Fund is working with country programs and other global health actors to plan for their market introduction. Part of this work is estimating the market for new Near Point of Care tests. Global Fund will present their approach and early data on potential demand forecasts for various use cases, based on regional dialogues with national programs, lab directors, and civil society for the Global Fund 25 priority countries.

The Diagnostics Equity Consortium: A civil society-led mechanism for ambition and accountability for closing diagnostic gaps

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The Diagnostics Equity Consortium is a civil society-led movement focused on advocacy to scale up access to essential diagnostics.This session will describe DEC and the role of civil society to improve ambition and accountability for the introduction and scale up of new TB diagnostics at the national level.

SY31-410-31 It takes a village: Advancing late-stage TB vaccine trials in adults and adolescents through global collaboration

Chair: Elana Van Brakel, IAVI, Stellenbosch, South Africa
Chair: Alexander Schmidt, Gates Medical Research Institute, Germany

New TB vaccines are on the horizon with multiple candidates now in late-stage development. Bringing a vaccine candidate across the finish line requires close collaboration with multidisciplinary partners around the world, leveraging expertise in clinical trial design, epidemiology, and immunology, among others. In this timely session, speakers will explore the breadth of work necessary to successfully run a late-stage clinical trial.
The session will open with status updates from the moderators on two promising late-stage candidates, M72/AS01E and MTBVAC, followed by a series of presentations on key design considerations for late-stage trials, including asymptomatic TB, the role of epidemiology, participant recruitment and community engagement.
Speakers will further reflect on important challenges, opportunities, and lessons learned to launch and run a late-stage trial, including insights on vaccine hesitancy.

Epidemiology in support of late-stage TB vaccine trials

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Epidemiological research is critical in guiding strategies to accelerate TB vaccine development. Epidemiological models provide insights into disease transmission dynamics, optimal age groups for vaccination, and the impact of local healthcare infrastructure on implementation strategies.
The X103 HOPE Study, an epidemiological support initiative, will generate robust data to address regional variations in TB prevalence and resource availability, particularly in high-burden regions like sub-Saharan Africa. Collaborative efforts to integrate epidemiological insights into vaccine development pipelines are necessary to deliver new vaccines that are both effective and adaptable to diverse populations, paving the way for transformative solutions in combating TB.

Asymptomatic TB: Unique opportunities in tuberculosis vaccine trials

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Active tuberculosis disease can be asymptomatic (subclinical tuberculosis) or symptomatic with the former comprising approximately 50–60% of prevalent tuberculosis in endemic countries and largely remaining undetected and globally underestimated. TB vaccine development targets prevention of active pulmonary TB disease but may need to be broadened to address the challenging dimension of asymptomatic TB. No TB vaccine has been assessed for its ability to prevent asymptomatic TB and there is limited evidence about the natural history of asymptomatic TB progression. Preventing asymptomatic tuberculosis is likely to save lives, reduce the amplification of the epidemic, and reduce long-term pulmonary disability.

Recruitment of adolescents for late-stage TB vaccine trials

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Enrolling adolescents for late-stage vaccine trials presents several challenges. Complex informed consent processes, ethical concerns, especially in low resource settings, and cultural norms around enrolling minors, concerns about vaccine safety and potential side effects as well as contraception requirements for adolescent girls with first debut sexual activity affect recruitment. Adolescents' school commitments and parents' work schedules can limit availability for trial visits. Being a highly mobile population makes it difficult to ensure long-term follow-up.
Various strategies such as community engagement, clear communication about trial benefits and risks, and flexible scheduling can be implemented to overcome these challenges.

Vaccine hesitancy and TB vaccine development

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Vaccine hesitancy poses a significant challenge to trial participation, impacting the success of vaccine trials across various diseases, including tuberculosis (TB). Lessons from the Covid-19 vaccine roll-out as well as from HIV interventions can be used to mitigate vaccine hesi-

tancy for new TB vaccines, while remaining cognizant that there are likely key differences. Community engagement, transparent communication, and partnership development are vital to build trust in new TB vaccines. Understanding local cultural beliefs and socio-political contexts is crucial. Effective implementation and equitable access are key, with civil society-private sector partnerships offering potential for trust-building.

SY32-420-32 Ensuring global access to shorter, better regimens for multi-drug-resistant/rifampicin-resistant TB for children, adolescents and pregnant women

Chair: Martina Casenghi, Independent Consultant, Geneva, Switzerland
Chair: Jennifer Furin, Harvard Medical School, Department of Global Health and Social Medicine, boston, United States

Significant progress has been made in recent years in identifying shorter, all-oral treatment regimens for managing multidrug/rifampicin-resistant TB (MDR/RR-TB). These regimens should be prioritized for children, adolescents, and pregnant/lactating women to improve tolerability and ensure favorable outcomes in these vulnerable populations. However, these groups risk being left behind, as the 6-month BPaLM regimen (bedaquiline, pretomanid, linezolid, moxifloxacin) is not currently recommended for use in these populations.
Recently, WHO has endorsed several alternative shorter, all-oral regimens based on emerging evidence. These include a 6-month regimen of bedaquiline, linezolid, levofloxacin, delamanid, and clofazimine, as well as various 9-month regimens centered around bedaquiline, linezolid, and pyrazinamide, combined with third-generation fluoroquinolones and/or delamanid, for use in children and adolescents and during pregnancy/lactation.
This session will present early experiences from national programs and implementing partners in rolling out the alternative shorter regimens for these vulnerable populations, highlighting key lessons learned, implementation challenges, and practical solutions.

Treatment as short as six months for drug-resistant TB in children, adolescents and pregnant/lactating women: An update on global guidance

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Based on evidence from the BEAT tuberculosis and End TB trials, WHO recently recommended a regimen composed of 6 months of bedaquiline, delamanid, linezolid, levofloxacin or clofazimine as well as three additional 9-month regimens for the treatment of MDR/RR-TB. Through extrapolation of efficacy in adults, these regimens can be used in children and adolescents and during pregnancy/lactation as well.
This presentation will cover the evidence as well as implementation considerations for the use of these regimens, including drug susceptibility results (of the child or the source of infection), availability of paediatric formulations, severity of disease and monitoring ability, among others.

Early experiences with shorter, all-oral multi-drug-resistant TB regimens in children and adolescents in Papua New Guinea

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This presentation describes Papua New Guinea's transition to shorter, all-oral MDR-TB regimens for children. After phasing out injectable drugs in 2019, PNG adopted an individualized 18-month all-oral regimen. In January 2024, a 9–12 month individualized regimen was introduced, followed by official adoption of the WHO-recommended 6-month regimen (based on the BEAT-Tuberculosis trial) in December 2024. The first children were enrolled in early 2025. This transition was guided by consultation with the paediatric community, National TB Program, partners, and global experts, accounting for challenges such us workforce limitations, drug supply logistics, and high rates of malnutrition and severe TB.

Introducing shorter drug-resistant TB treatment regimens for children and pregnant/lactating women in South Africa: Key lessons learned

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Pregnant women and children are usually excluded from clinical trials investigating new therapeutic agents. Historically, this has severely restricted access to novel antituberculosis drugs and treatment regimens for children and pregnant women with MDR/RR-TB. Based on the results of progressive clinical research studies such as endTB and BEAT-Tuberculosis, the WHO now recommends shorter MDR/RR-TB treatment regimen alternatives for pregnant and lactating women as well as children.
Here we present the successes and challenges of implementing shorter regimens for routine treatment of MDR/RR-TB in children and pregnant and lactating women in the South African National Treatment Programme

Using shorter all-oral regimens for children and adolescent with multi-drug-resistant/rifampicin-resistant TB: Experience from Peru

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Since October 2023, Peru has been implementing shorter, all-oral regimens for patients with MDR/RR-TB, including children and adolescents, under programmatic conditions.
In this presentation, we will share the experience of introducing and scaling up these regimens and present treatment outcomes for children and adolescents with MDR/RR-TB who received either a 9-month regimen (e.g., Bdq, Lzd, Lfx, Cfz, Z/Cs; Bdq, Lzd, Mfx, Z; or Bdq, Lzd, Cfz, Lfx, Dlm) or a 6-month regimen (Bdq, Pa, Lzd, Mfx) at Ministry of Health facilities across Peru

Ensuring access to shorter multi-drug-resistant/rifampicin-resistant TB regimens for children using a novel web-based costing tool

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Child-friendly dispersible tablet formulations are now available for all second-line TB drugs. These formulations improve the accuracy of dosing, are more palatable and easier to administer, and are strongly preferred by children and their caregivers. Uncertainty around costs of drugs and formulations for children introduces challenges for planning and can be a barrier to procurement of these preferred formulations.
This presentation will discuss a newly developed freely accessible web-based tool that incorporates weight-banded dosing and available child-friendly formulations, in which costs and regimens can be adapted to local contexts to facilitate setting-specific planning and procurement.

SY33-430-33 Lymph node TB: Identifying priorities, challenges, and finding better treatments faster

Chair: Graeme Meintjes, Queen Mary University of London; University of Cape Town, United Kingdom
Chair: Conor Tweed, University College London, London, United Kingdom

Lymph node tuberculosis (LNTB) is the most common presentation of extra-pulmonary TB globally, accounting for an estimated 15 – 20% of cases globally. However, our understanding of the diagnosis, disease course and management of this disease is poor compared to pulmonary TB.
This symposium will begin with addressing the priorities relating to diagnosis, management, and novel treatments of people affected by LNTB. LNTB in clinical trials since 1993 will be presented to demonstrate how this common presentation has been represented when generating evidence for treatment.
Our current understanding of the immunology of LNTB and paradoxical reactions will be discussed, including what we know about the host-pathogen interaction and post-treatment paradoxical reactions.
These areas both have implications for developing novel treatments, in particular host-directed therapies, and the session will conclude with a consideration of the questions we need to answer in clinical trials to get to better treatments faster.

The perspective of persons affected by lymph node TB

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The perspectives of the people who will be investigated and treated for LNTB must be central when evaluating the current situation and discussing future directions for research.
Blessi Kumar will speak about her personal experience with LNTB and to the challenges of diagnosis, how people being treated view paradoxical reactions, and treating a condition with no clear definition of cure. The implications for researchers developing novel regimens will also be discussed when the aim is to cure a disease more commonly causing morbidity rather than mortality.

Missing nodes: A systematic review of representativeness of lymph node TB in randomised treatment trials

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Randomized clinical trials are considered the gold standard for evidence on treatment effect, and underrepresentation of different populations or disease presentations means these groups will be treated based on poorer quality of evidence.
This talk presents results from a systematic review assessing the representation of lymph node tuberculosis (TB) in randomized treatment trials from 1993. The aim is to compare the inclusion and reporting of lymph node TB trials with the global epidemiological data to highlight gaps and implications for the generalizability of current evidence.

The immunology of lymph node TB and the host-pathogen interaction

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Our understanding of the host-pathogen interaction in LNTB without overt TB disease is limited, but is an essential component in the development of new treatments. After entering the body by aerosol inhalation, mycobacteria will migrate to the lymph nodes, and some will develop isolated LNTB disease.
This talk will use data obtained from a cohort of postmortem cases from South Africa to present findings on the relationship between mycobacterial synthetic activity and the host immune system in people who had clinically active disease, and those with no clinical signs but mycobacteria detected in lymph node samples.

Untangling paradoxical reactions: What, when, who and where?

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Paradoxical reactions represent one of the greatest dilemmas for the clinician managing TB and the response will vary widely between healthcare practitioners. In this session, the results from a recent systematic review will be used to present the latest evidence on what paradoxical reactions look like in LNTB and what is known about the drivers.

How this compares to disease affecting other body systems, and the impact on treatment and assessment of cure will be addressed. The talk will close with a review of post-treatment paradoxical reactions and the complexity they generate.

Lymph node TB clinical trials: How do we pick the low-hanging fruit?

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LNTB presents many challenges for the clinical trialist seeking to identify new, efficacious treatment regimens, and the final talk of the symposium will address questions relating to trial design and conduct, such as how to approach the issue of diagnosis and inclusion criteria for a LNTB treatment trial.
For example, what are the implications for including only microbiologically-confirmed disease?
What is the most appropriate design to account for paradoxical reactions, and what are the implications for each approach?
How could immunomodulating therapy be incorporated into a trial?
The talk will conclude with an overview of a suggested LNTB trial.

SY34-440-34 Generating social science evidence alongside TB trials: Opportunities and impacts

Chair: Rovina Ruslami, Universitas Padjadjaran, Bandung, Indonesia
Chair: Samuel Schumacher, World Health Organization, Geneva, Switzerland

Social science evidence on equity, cost, feasibility, acceptability and user values are increasingly valued in policy recommendations regarding new tools and technologies, and now called for within WHO guidance on evidence generation in TB. Social science can be particularly relevant when clinical data show equivalent outcomes between a novel intervention and comparator arm, or when trialed interventions have failed to show impact in programmatic settings.
This SSHIFTB session showcases various approaches and experiences of integrating social science research alongside clinical trials on diagnostic accuracy, whole genome sequencing, novel regimens, and other treatment interventions, from researchers and community actors working through multiple disciplines in diverse global regions.
Taken together these talks will provide recommendations for how to build a broader and stronger knowledge base for policy development, which can ultimately lead to stronger recommendations for novel TB interventions.

Community engagement in TB trials: How to optimise impact and overcome challenges

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Effective community engagement can improve the quality of evidence generated from clinic trials and research studies, as well as dissemination of results and uptake of recommendations. Context-appropriate mechanisms to engage communities in research need to be prioritised as to enable community voices to shape research priorities. Ingrid will highlight key opportunities for community contributions to optimise planning and implementation of research using examples from South African research studies. She will share lessons learned to overcome challenges such as insufficient resources, language barriers, cultural differences and power dynamics.

Integrating mixed-methods research in a paediatric TB diagnostic accuracy trial in Uganda and Peru

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In this presentation, we highlight practical insights gained from adopting a mixed-methods approach in the NOD-pedFEND study, a paediatric TB diagnostic accuracy trial involving intensive sample collection. We explored the lived experiences, preferences, and trade-offs faced by caregivers, clinicians and National TB Program stakeholders in their paediatric TB diagnostic journey in Uganda and Peru.
Findings from interviews, focus group discussions and a discrete choice experiment not only offered insight on diagnostics acceptability and the implementability of person-centred diagnostic pathways, but also shaped our understanding of trial acceptability. We present key findings while reflecting on operational challenges and lessons learned.

Laying the groundwork for the ethical implementation of genomic sequencing for TB in Botswana

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This talk highlights how social science evidence and approaches can shape the uptake of TB innovations pre-trial. In two qualitative studies with TB stakeholders in Botswana aimed at assessing the ethics and feasibility of implementing genomic sequencing for TB, we engaged healthcare workers, policymakers, people with and affected by TB, advocates, and others.
In interviews and deliberative dialogues for the first study, participants supported sequencing and provided recommendations for ethical implementation.
The second study uses interviews and focus groups to develop generalizable implementation strategies for targeted next-generation sequencing, following WHO recommendations. These strategies can later be trialed to assess effectiveness.

Methodological and resource considerations for the successful execution of social science studies alongside TB treatment trials

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This presentation conveys the relevance and added-value of running social science studies to support the design, implementation, interpretation of outcomes, and 'real-world' effectiveness of TB treatment trials and interventions.
Borrowing on examples of studies undertaken pre-, during and post-trial, the talk will explicate:
1. Methodological considerations, relevant frameworks, and resource needs for planning social science oriented aims alongside trials, and;
2. Exemplify the diversity of evidences that may be consequently gained, such as data on patient values and preferences, acceptability, equity and feasibility considerations, pathways of intervention effect, intervention fidelity, differential outcomes in subpopulations, and unintended harms and benefits.

Bringing social science evidence on novel TB interventions to global guideline development

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This talk details how social sciences evidence on the added value, feasibility, usability, acceptability, equity and implementation considerations of new TB interventions can be brought to bear on decision-making tables at WHO.
We will draw on five qualitative studies and a systematic review on user perspectives about different diagnostics with clinicians, laboratory staff, programme officers, TB survivors, and community representatives across multiple countries in Africa, Eastern Europe, Central and South Asia.
We will discuss key insights on new interventions that these studies enabled and how they act as a tool of engagement in the development of global guidance.

SY35-450-35 TB in an era of arctic self-determination

Chair: Jennifer Munick-Watkins, Nunavik Regional Board of Health & Social Services, Canada
Chair: Faiz Ahmad Khan, McGill University & the Research Institute of the McGill University Health Centre, Montreal, Canada

Inuit are Indigenous peoples of the Arctic. Inuit in Canada, Greenland, and Denmark —the majority of the world's Inuit population—experience high rates of tuberculosis, albeit with differing trends.
In Canada, tuberculosis incidence amongst Inuit is over 300-times the incidence amongst Canadian-born non-Indigenous people and has been rising in some jurisdictions.
In Greenland, in the past decades incidence has fallen since peaking in 2010. **In Denmark**, incidence is highest amongst the Greenlandic origin population. Inuit, as other Indigenous peoples around the world whose lands were colonized, are increasingly regaining self-determination over their land and health services.
Our objective is to compare tuberculosis history, epidemiology, and elimination strategies in Canada, Greenland, and Denmark, with a specific focus on alignment with Inuit self-determination. Participants will hear from **a diverse panel representing 3 nations & including four Inuit speakers** sharing policy & research experiences addressing tuberculosis at local, regional and national levels.

Inuit Tuberculosis Elimination Working Group: A space for Canadian Inuit self-determination and learning

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With the development and implementation of the Inuit Tuberculosis (TB) Elimination Framework in 2018, Inuit Treaty Organizations (ITOs) have been leading TB elimination activities in Inuit Nunangat. Through the Inuit Tuberculosis Elimination Working Group, ITOs have a convening space to share and learn from each other and advance TB elimination together across Inuit Nunangat.
ITOs discuss successes, challenges and processes of TB programming, which include implementing interferon gamma release assay (IGRA) in remote settings, different education and engagement strategies, and healthcare provider training and education.

Parnasimautik: A Nunavik Inuit story of reclaiming self-governance applied to TB

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Nunavik is the colonized Inuit homeland within the province of Quebec, Canada. Since the 1970s, Nunavimmiut (Nunavik Inuit) have been reclaiming increasing authority over their land, resources, and lives. In this riveting talk, the audience will hear from someone who has spent much of their life in public service in Nunavik, both in her home community and across the region.
The talk will provide an overview of historical and present-day actions through which Nunavimmiut reclaim sovereignty, and how these have led to the launching of a recent regional initiative to create the first ever Nunavimmiut Declaration on TB in Nunavik.

Community-based research to action: Inuit experiences with TB in Nunavik shaping a community public health worker programme

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Nunavimmiut—Inuit indigenous to Nunavik (in Quebec, Canada)—face tuberculosis rates over 150-times the provincial average of Quebec.
This presentation will describe how a community-based participatory research project involving Nunavik's health authorities, leaders, and an Inuit steering committee, was developped and executed. The audience will learn how research results are shaping tuberculosis policies alongside informing roles and training for ?Inuit lay public health workers.

Kalaallit (Inuit) on the frontline of TB care in Kalaallit Nunaat (Greenland)

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Greenland has self-governance of the Health System since 1992. The majority of Greenland's population is Kalaallit. University of Greenland, Ilisimatusarfik, has capacity for 15 new nursing students per year. Kalaallit can be assigned as medical students in a Danish University.
Today, there are about 15 Greenlandic medical students in Denmark. By contrast, the Faroe Islands, with the same population size as Greenland, has 120 medical students in Denmark. The fight against tuberculosis in Greenland necessitates nurses and doctors speaking Greenlandic for

better compliance and patient empowerment. In general, Greenland needs empowerment through more Kalallit doctors and nurses for more sustainability.

A historical and epidemiological overview of TB and its elimination strategies in Greenland and in Inuit in Denmark

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Like in Arctic Canada and Alaska, tuberculosis (TB) incidence in Greenland in the 1950s was alarmingly high, leading to a range of efforts against TB. TB incidence in the country reached low levels in the 1980s, but increased since then, leading to new national TB reduction strategies. About 17,000 Greenlanders live in Denmark, corresponding to 30% of the population of Greenland. Of all ethnic groups in Denmark, this group has the highest TB incidence in the country.
This presentation will give an overview of the epidemiology and elimination strategies for TB in Greenland and Greenlanders in Denmark.

SY36-460-36 Scaling-up community-wide TB screening irrespective of symptoms: Recognising and overcoming the barriers

Chair: Hanif Esmail, University College London, London, United Kingdom
Chair: Anna Coussens, Walter and Eliza Hall Institute of Medical Research (WEHI), Melbourne, Australia

There has been little change in global TB incidence in the 21st century with progress towards the End TB targets off track. Recently there has been increased recognition that many people with undiagnosed, potentially infectious TB are asymptomatic and that they can be identified by symptom-agnostic screening (e.g. with chest X-Ray).
While this screening activity is increasing globally, current levels fall far short of what is needed to impact transmission and significant scale-up within communities is required. There are major challenges to undertaking such scale-up but this is not without precedent and is needed if we are serious about ending TB by 2050.
In this symposium we will explore the political, financial and health system barriers and solutions to scaling up community wide screening, discuss the opportunities and challenges of different screening strategies and treatment approach and reflect on how communities can best be engaged to participate in screening activities

Show me the money: Making the investment case for community-wide screening

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While community screening is the only intervention proven to have population wide and persistent epidemiological impact, the required resources are beyond existing TB budgets. To mobilise funds, it is important to identify novel financing sources and make a clear investment case with tailored messaging to the range of audiences that meet their demand.
This presentation will describe the need for a community screening investment case, available and innovative financing sources, as well as prominent examples of innovative financing towards ending TB.

Participation is key: Community sensitisation

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In order to have sufficient population coverage to have impact, screening requires the acceptance and participation from the community. Achieving this needs a co-ordinated approach involving meaningful community engagement and participation, effective and sustained sensitization through a variety of traditional and social media campaigns, broader education initiatives and incentivization for majority participation.
This talk will reflect on some of the successful approaches used both historically and more recently.

To X-Ray or not to X-Ray: That is the question

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Historic data demonstrate that recurrent rounds of symptom-agnostic community wide CXR screening had the greatest reduction in TB incidence over 20 years when population coverage was highest. Despite technological advances in CXR portability and AI-CAD reading, logistical and human resource requirements remain the greatest challenges to achieving testing access for all communities.
This talk will discuss the operational considerations, community engagement experience and diagnostic implications of using either a 2-step CXR for all + Xpert confirmation, or 1-step Xpert for all screening strategies.

The health system: Challenges in scaling up and scaling down

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Population-wide, symptom-agnostic TB screening represents a paradigm shift in case detection for most countries. While technological advancements have improved screening capabilities, successful implementation demands strategic planning and coordination across all WHO building blocks.
This talk will focus on the operational considerations for scaling up, and ultimately scaling-down, screening, including governance mechanisms, strategies for maintaining and expanding screening capabilities beyond chest imaging, coordinating management of non-TB abnormalities, addressing human resource needs, and exploring innovative financing models for cost-effective participation and support in TB screening efforts. Engaging both public and private healthcare providers will be crucial for comprehensive coverage.

Do no harm: Evaluating the risk of over-treatment in community screening

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A key risk of community screening is over-treatment; initiating asymptomatic individuals on TB treatment after a false positive CXR or Xpert diagnosis. Standard calculations suggest that even at the current threshold of 500/100k prevalence, most screening tools would lead to unacceptably high rates of over-treatment. However, these calculations have many flaws, some of which can be quantified.
This presentation will explore how our estimates of over-treatment change when considering test performance in the community rather than clinic, and critically evaluate the validity of the reference standard of sputum culture. Together, they may support a much lower threshold for screening.

SY37-470-37 A forgotten population: Finding TB and disparities within prisons

Chair: Jason Andrews, Stanford University School of Medicine, Stanford, United States
Chair: Salome Charalambous, The Aurum Institute, Johannesburg, South Africa

Tuberculosis rates in prisons are extremely high globally, with incidence greater than 10 times those of surrounding communities on average and major gaps in case detection and care. There remain critical questions about how to implement effective strategies to reduce this burden and address disparities affecting persons deprived of liberty. This symposium will share the latest evidence and experience from a diverse group of researchers and implementers representing five continents and varying epidemiologic contexts.
Presentations will cover lessons learnt in various settings, including Malawi, Kazakhstan, Ukraine, Paraguay and Cameroon. We have also included some talks that raise policy questions and evaluate the cost-effectiveness of possible TPT interventions.

Modelling TB preventive Therapy in Brazil's prisons

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Tuberculosis incidence has been increasing in Brazil in the past ten years, and the rise in incarceration has proved to be one of the leading causes.
We performed modelling and health economic analysis to investigate the impact of Tuberculosis Preventive Treatment (TPT) for Brazilian inmates on the TB epidemic in the country. Through scenario analysis we varied future rates of recidivism in the prison population and estimated the cost-effectiveness of possible TPT interventions.

Experience of use of Chest X-ray and CAD4TB for TB screening in Paraguay

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Digital Chest X-ray with CAD4TB software for automated readings in 5 different prisons in Paraguay reached a high specificity (>90%) but the sensitivity did not reach the WHO Target Product Profiles for a screening test. With the help of machine learning studying our database of almost 4000 participants we identified a potential method to improve the sensitivity of this screening tool without affecting its specificity. The costs involved with mass screening projects may be reduced significantly applying this method.

Experience of policy change to integrate prison infirmaries in the district health system in Cameroon

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We will describe the experience and outcomes of a policy change to integrate prison infirmaries to render quality care of TB, HIV, and of general health services in prisons in Cameroon. In practice, the integration with the National District Health Information System (DHIS2) where all health indicators including notification and care of TB cases.
Challenges identified during implementation include: overcrowding and undernutrition (structural); lack of performance of NTP with regards to drug shortages/ laboratory delays; lack of motivation of health staff and incentives for peer educators; lack of continuity of care; poor acceptance of prisons as health district entities.

ABSTRACT PRESENTATIONS TUESDAY 18 NOVEMBER 2025

ORAL ABSTRACT SESSION (OA)

OA01 Forgotten lungs: Emerging from the shadow of TB, silicosis, and NTM

OA01-100-18 Comprehensive epidemiological analysis of silicosis (J62) and concurrent tuberculosis (J65) in Brazil, 2006-2024

F.A. Dias e Sanches,[1,2] F.L. Romero Vega,[3] J.N.d. Barros Silva,[3] F. Dockhorn,[3] [1]Federal University of Rio de Janeiro, Tuberculosis Research Center, Rio de Janeiro, Brazil, [2]Piquet Carneiro University Policlinic, Governance and Compliace and Infection Prevention and Control comission, Rio de Janeiro, Brazil, [3]Ministry of Health, Brazil, National Tuberculosis Program, Brasília, Brazil
e-mail: sanches@hucff.ufrj.br

Background: Silicosis is a progressive fibrotic pneumoconiosis caused by crystalline silica inhalation. It represents a significant comorbidity as individuals with silicosis have increased susceptibility to Mycobacterium tuberculosis infection, making it a serious public health concern.
This study investigates the epidemiological profile of silicosis and its association with concurrent silicosis and TB in Brazil over nearly two decades.
Design/Methods: This descriptive and analytical epidemiological study utilized secondary data from Brazil's National Disease Notification Information System (SINAN) for the period 2006-2024. We calculated proportion indicators, relative risk, and temporal trends, and conducted multivariable analyses comparing isolated silicosis and concurrent silicosis and TB. Advanced statistical methods included chi-squared tests, risk ratio calculations, time series analysis with moving averages, linear regression for trend detection, and population attributable risk calculations.
Results: Among 2,784 reported individuals with silicosis, 39 people with concurrent silicosis and TB were identified (1.40%). Temporal trend analysis revealed increasing numbers of people with silicosis (coefficient +7.65/year, $R^2 = 0.17$) and slightly decreasing concurrent TB (-0.14/year, $R^2 = 0.13$).
The proportion of TB among people with silicosis showed significant reduction over time, from 3.15% in 2006-2011 to 0.31% in 2018-2024 ($\chi^2 = 403.81$, $p<0.001$). Risk ratio analysis revealed a 10.12-fold higher risk in the earliest period compared to the latest period. Significant demographic disparities were observed, with indigenous populations showing a 76.86-fold higher relative risk compared to white populations.
Based on international literature, we estimated 90.66% underreporting of concurrent silicosis and TB, with significant economic and health impacts.
Conclusions: Our findings demonstrate a decreasing proportion of tuberculosis among people with silicosis over time, despite an increasing trend in isolated silicosis. Substantial underreporting and heterogeneity in diagnostic methods suggest the need for strengthening occupational epidemiological surveillance.
Additionally, people-centered interventions addressing demographic disparities and high-risk occupational sectors, particularly mining, are urgently needed.

OA01-101-18 Global patterns and trends in mesothelioma incidence in 185 countries: A population-based study

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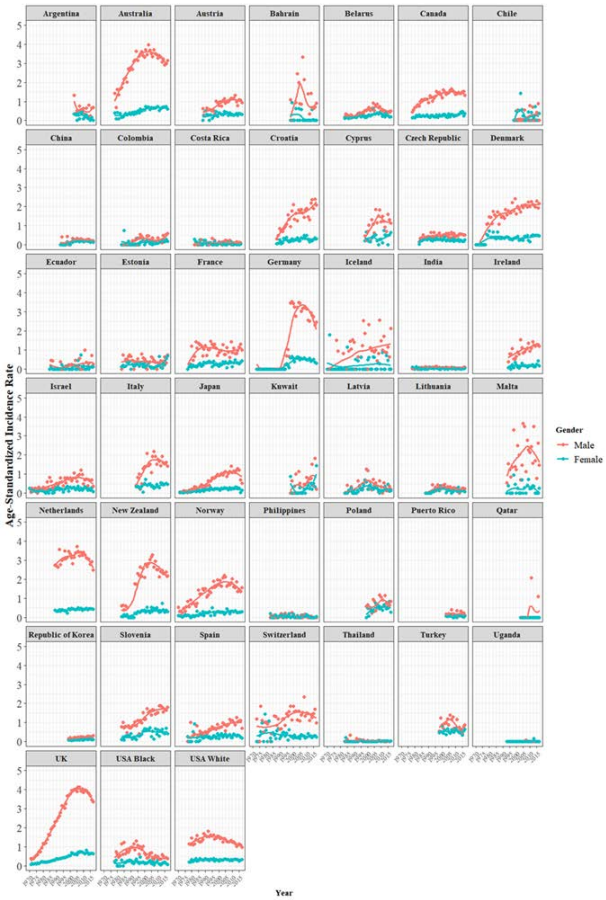
Background: Mesothelioma is a rare and aggressive cancer primarily caused by asbestos exposure, predominantly affects older adults with occupational asbestos exposure.
Design/Methods: This population-based study utilized the GLOBOCAN 2022 database to estimate mesothelioma incidence and mortality across 185 countries in 2022.
Long-term trends were assessed using the Cancer Incidence in Five Continents (CI5) Volume XII and CI5 *plus* databases. Age-standardized incidence rates (ASIRs) were calculated, and Joinpoint regression analysis was employed to assess trends in mesothelioma ASIRs by estimating the average annual percentage change (AAPC).
Results: In 2022, there were an estimated 30,633 new mesothelioma cases globally, with an ASIR of 0.28 per 100,000. Europe had the highest burden, accounting for 48.1% of global cases and 48.4% of deaths. There was a significant positive correlation between the ASIR or ASMR and Human Development Index.
From 2003 to 2017, while mesothelioma incidence decreased in many regions, significant increases were observed among male in Croatia (AAPC: 2.5, 95% CI: 0.3 to 4.8), the Republic of Korea (2.5, 1.2 to 3.7), and Slovenia (1.2, 0.1 to 2.2), as well as in female in Canada (4.5, 1.3 to 7.9).
Mesothelioma incidence declined significantly in males in Australia, Belarus, Germany, Israel, the Netherlands, New Zealand, Norway, Turkey, the UK, and White Americans, and in females in Belarus, Germany, and Turkey.



Conclusions: Mesothelioma remains a significant global health challenge, with notable geographic and socioeconomic disparities. Sustained public health efforts are needed to eliminate asbestos exposure and reduce disease burden, particularly in regions with rising incidence and underdiagnosis.

OA01-102-18 Respiratory symptoms in Rwandan mineworkers with silicosis

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Background: Little is known about the burden of respiratory symptoms amongst mineworkers with silicosis and how they are impacted by the presence of fibrosis. In 2022, Partners In Health conducted the first silicosis case-finding program in Rwanda, identifying a 9.2% prevalence amongst active Cassiterite mineworkers in Kayonza District.

Design/Methods: We conducted an observational cross-sectional study of mineworkers with confirmed radiographic silicosis during their initial visit to a dedicated silicosis clinic at Rwinkwavu District Hospital, Rwanda. During visits, clinic staff measured pulse oximetry and administered the four item Respiratory Symptom Questionnaire (RSQ). We also collected baseline clinical and demographic characteristics. We compared outcomes based on the presence of fibrosis on screening chest radiography.

Results: Pulse oximetry and RSQ data were recorded for 83 patients with confirmed radiographic silicosis during their initial follow-up clinic visit. The median age was 42 (IQR 37-47) and mineworkers had spent a median of 15 years mining (IQR 12-20). 14 (16.9%) mineworkers had accelerated silicosis (i.e. silicosis that developed with less than 10 years of exposure) and 18 (21.7%) had evidence of fibrosis on chest x-ray. 6 (7.2%) patients were hypoxemic on room air at their follow-up visit, including 3 (16.7%) patients with fibrosis and 3 (4.6%) without fibrosis (p-value 0.08). 60 (72.3%) reported respiratory symptoms.

The median RSQ score for all mineworkers with silicosis was 2 (IQR 0-2) out of a possible 16. Mineworkers with fibrosis had significantly higher median RSQ scores (6 [IQR 1-9]) compared to those without fibrosis (2 [IQR 0-3], p-value 0.003).

Among mineworkers with fibrosis, 13 (72.2%) reported activity limitation due to respiratory symptoms, compared to 27 (41.5%) without fibrosis (p-value 0.021).

Conclusions: Respiratory symptoms are common amongst mineworkers with silicosis. The presence of fibrosis is associated with an increased burden of symptoms. Despite the burden of symptoms, few patients reported using inhaled medications.

OA01-103-18 Detecting radiological signs suggestive of silicosis in chest radiographs using artificial intelligence: A pilot retrospective cross-sectional study

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Background: Silicosis is a growing occupational health concern, especially in mining and construction. It increases the risk of tuberculosis (TB), creating a dual burden in high-risk populations. Chest X-rays (CXR) are commonly used for diagnosis, but limited radiology expertise leads to underdiagnosis. High-resolution CT offers better accuracy but is costly and less accessible. Delayed diagnosis postpones compensation and prolongs exposure. AI-based computer-aided detection (CAD) tools like qXR, already used for TB screening, offer scalable solutions to improve silicosis detection. We evaluated qXR's performance in identifying silicosis on CXR for integrated lung health screening.

Design/Methods: The qXR silicosis model, based on a Swin Transformer architecture, was trained on CXRs labelled by radiologists or occupational health specialists from multiple regions. We retrospectively evaluated its performance on 633 CXRs using radiologist reports as reference. Diagnostic metrics—sensitivity, specificity, precision, F1 score, and area-under-the-receiver-operating-characteristic-curve (AUROC) - were calculated. Gwet's AC1 was used to assess model–radiologist agreement, and TB overlap was evaluated using a confirmed TB dataset.

Results: Among 633 CXRs, 183 (28.9%) were labeled as silicosis by radiologists, supported by a history of RCS exposure and CT confirmation. At a threshold of 0.29, the Swin-based qXR silicosis model achieved: **sensitivity 98.36%, specificity 98.67%, AUROC 0.9994, precision 96.77%, F1 score 0.9756, and Gwet's AC1 0.9656**. The confusion matrix showed 180 true positives, 444 true negatives, 6 false positives, and 3 false negatives. In 110 TB-only cases, the model produced just 5 false positives, highlighting its ability to differentiate silicosis from TB despite overlapping radiographic features.

	Radiologist positive	Radiologist negative
AI positive	180	6
AI negative	3	444

Table 1: Confusion Matrix (AI vs Radiologist Ground Truth at Threshold = 0.29).

Conclusions: The qXR silicosis model demonstrated excellent diagnostic accuracy, with near-perfect sensitivity and specificity against radiologist reports, and minimal overlap with radiological signs of TB. Integrating such tools into occupational health programs could enable timely diagnosis, support worker compensation processes, and advance combined silicosis-TB screening strategies in high-risk populations.

OA01-104-18 Epithelial-macrophage interactions in cystic fibrosis are responsible for accelerated *Mycobacterium abscessus* growth

A.T. Lorenz,[1,2] B.M. Saunders,[3] W.J. Britton,[2,4] M.D. Johansen,[1] [1]Centre for Inflammation, University of Technology Sydney and Centenary Institute, Sydney, Australia, [2]Tuberculosis Research Program, Centenary Institute, Sydney, Australia, [3]School of Life Sciences, University of Technology Sydney, Sydney, Australia, [4]Department of Clinical Immunology, Royal Prince Alfred Hospital, Sydney, Australia

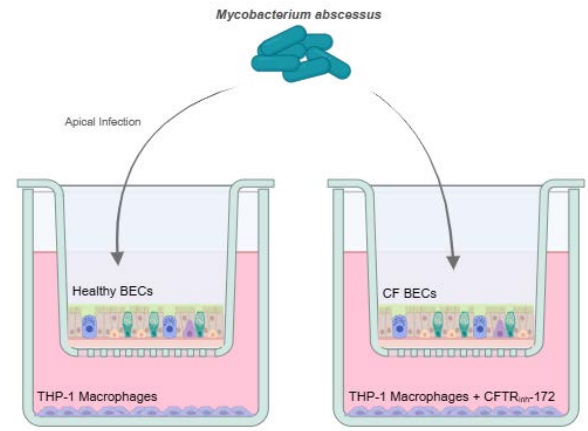
Background: *Mycobacterium abscessus* (MABS) is of global concern due to high antimicrobial resistance and poor treatment prognosis. It is of particular concern in Cystic Fibrosis (CF), a disease caused by mutations in the *CFTR* gene. Whilst macrophages are the preferred mycobacterial niche, the role of the respiratory epithelium in MABS infection is largely uncharacterised.

Furthermore, the complex epithelial-immune interactions underpinning MABS infection in CF airways are unknown.

Design/Methods: To examine epithelial-macrophage interactions during MABS infection we established a novel co-culture system of bronchial epithelial cell lines (BECs) at the air-liquid interface, and THP-1 macrophages in the basolateral compartment of a transwell. Co-cultures consisted of healthy BECs and THP-1 macrophages or CF BECs with THP-1 macrophages treated with the CFTR inhibitor- $CFTR_{inh}$-172.

Co-cultures were infected apically with MABS, then bacterial growth and cytokine secretion were compared between healthy and CF conditions.

In additional experiments, compounds modulating CFTR or TNF were added to the basolateral compartment.



Results: CF BECs cultured with $CFTR_{inh}$-172 treated macrophages, displayed significantly higher MABS growth compared to healthy BECs. $CFTR_{inh}$-172 treated macrophages alone showed no increase in MABS uptake or growth, suggesting CF susceptibility to MABS requires

defective CFTR function in both BECs and macrophages. TNF, IL-8 and IL-10 secretion was markedly reduced in CF conditioned cells, indicating dysregulated epithelial-immune cross-talk.
The addition of Etanercept (TNF-receptor antagonist) did not impact bacterial burden in the co-culture system, illustrating accelerated MABS growth in CF conditions is due to TNF-independent mechanisms. Restoring CFTR function in CF co-cultures, using Trikafta, a CFTR modulator therapy (Elexacaftor/Tezacaftor/Ivacaftor), reduced MABS growth to levels observed in healthy co-cultures, demonstrating that deficient CFTR function drives increased MABS burden.
Conclusions: This study demonstrates the importance of epithelial-macrophage interactions in the host response to MABS infection and fundamentally implicates CFTR as a driver of MABS susceptibility.

OA01-105-18 Antibiotic prescriptions - A risk factor for nontuberculous mycobacterial disease?

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Background: Nontuberculous mycobacterial (NTM) infections are difficult to diagnose, often resulting in diagnostic delays. Studies have identified advanced age, prior tuberculosis, underlying pulmonary diseases, and immunosuppression as risk factors for NTM disease. We aimed to investigate whether antibiotic use prior to diagnosis was more prevalent in patients with NTM disease compared to matched comparators.
Design/Methods: We conducted a nationwide register-based cohort study, including all adult patients diagnosed with NTM disease (based on ICD-code) in Denmark from 2000-2017. Denmark is a high-income country with free, uniform and tax-funded healthcare. Patients were categorised as either pulmonary NTM (P-NTM) or extra-pulmonary NTM (E-NTM) based on diagnostic and procedural codes. Patients were matched 1:4 to comparators by age, sex, cohabitation, and municipality. Differences between groups were assessed using the χ^2 test. Antibiotic use prior to diagnosis was evaluated using a negative binomial regression model.

Results: Patients with either P-NTM (n=661, 49.6% female) or E-NTM (n=485, 40.4% female) were prescribed significantly more antibiotic treatments in the three years preceding NTM diagnosis compared to comparators, both in overall antibiotic prescriptions and specifically for beta-lactams, macrolides, and quinolones (Table 1).

	P-NTM			E-NTM		
	3 years prior IRR (95% CI)	2 years prior IRR (95% CI)	1 year prior IRR (95% CI)	3 years prior IRR (95% CI)	2 years prior IRR (95% CI)	1 year prior IRR (95% CI)
Beta lactam	3.17*** (2.72-3.69)	3.00*** (2.57-3.51)	4.22*** (3.68-4.84)	2.04*** (1.66-2.51)	2.38*** (1.97-2.87)	4.09*** (3.49-4.79)
Macrolides	3.71 *** (2.82-4.89)	4.24*** (3.23-5.55)	6.66*** (5.28-8.40)	1.57* (1.09-2.26)	2.12*** (1.52-2.97)	3.89*** (2.88-5.25)
Other#	6.24 *** (2.29-16.98)	3.33** (1.35-8.22)	4.07*** (1.80-9.23)	2.10 (0.56-7.85)	2.64 (0.80-8.74)	2.71* (1.02-7.19)
Quinolones	7.49 *** (4.59-12.21)	5.78*** (3.80-8.81)	10.96*** (7.61-15.78)	3.47*** (1.93-6.24)	3.21*** (1.68-6.13)	6.40*** (4.01-10.23)
Sulfonamides/ trimethoprim	1.48 (0.93-2.36)	1.51 (0.96-2.38)	1.59 (0.98-2.57)	1.40 (0.78-2.51)	1.82 (0.99-3.33)	2.84*** (1.73-4.65)
Tetracyclines	1.92 (0.86-4.27)	2.32* (1.05-5.11)	5.02*** (2.72-9.26)	0.71 (0.27-1.83)	2.25 (0.84-6.01)	7.68*** (3.96-14.92)
Any type antibiotics	3.41 *** (2.94-3.95)	3.31*** (2.86-3.84)	4.89*** (4.27-5.59)	1.89*** (1.55-2.30)	2.35*** (1.95-2.82)	4.04*** (3.46-4.71)

Table 1: Table of antibiotic use (incidence of prescriptions) for patients with P-NTM and E-NTM compared to matched controls.

*#Other antibacterials include all classes not otherwise mentioned. IRR: Incidence rate ratio, P-NTM: Pulmonary nontuberculous mycobacterial disease, E-NTM: Extrapulmonary nontuberculous mycobacterial disease. 95% CI: 95% Confidence Interval. * p<0.05, **: p<0.01***: p<0.001*

Conclusions: Patients diagnosed with NTM disease were prescribed significantly more antibiotics across most classes compared to matched comparators up to three years prior to diagnosis. Increased antibiotic use could be a risk factor for NTM disease, by disturbing the normal microbiome. However, increased antibiotic exposure likely also reflects diagnostic difficulties or higher comorbidity burden necessitating antibiotic treatment.
Clinicians should consider NTM disease when experiencing frequent antibiotic use, especially in patients with additional risk factors. Further studies are needed to elucidate if pre-diagnosis exposure to specific antibiotics is associated with antibiotic resistance, or outcomes, of NTM disease.

OA01-106-18 GeneXpert-negative samples with *rpoB* amplicons reveal High NTM prevalence: A diagnostic opportunity

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Background: Non-tuberculous mycobacteria (NTM) pose a diagnostic challenge due to their symptom overlap with tuberculosis (TB). The GeneXpert Ultra assay, a widely used diagnostic tool for TB, could show *rpoB* probe amplification for samples negative for *Mycobacterium tuberculosis* complex (MTBC).
We hypothesized these samples could be NTM, and thus investigated the utility of the *rpoB* probes in identifying samples requiring NTM confirmation.
Design/Methods: Samples that were GeneXpert-negative for MTBC but showed *rpoB* amplification were subjected to confirmatory testing. Conventional PCR for *rpoB* and IS*6110*, culture on Lowenstein-Jensen (L-J) media, and targeted next-generation sequencing were performed to confirm the presence of NTMs and to identify species. Diagnostic performance of *rpoB* Ct values was evaluated to differentiate NTMs from other outcomes.
Results: Among 50 GeneXpert-Negative samples showing *rpoB* amplification, conventional PCR confirmed *rpoB* positivity in all cases. Culture on L-J slants revealed atypical mycobacterial growth in 86% (43/50) of samples, which was further confirmed by tNGS. tNGS identified 34 NTM isolates, with *M. gordonae* (20.5%) and *M. abscessus* (17.6%) being the most common (Figure 1).
Three Samples were found to be MTBC, and six were not detected in tNGS. Analyzing the Ct values of the *rpoB*2 probe showed significant differences between NTM, MTBC, and not-detected groups. An optimal Ct cutoff of 32.7 to detect NTM achieved a sensitivity of 82.4%, specificity of 77.8%, and a strong positive predictive value of 93.3%, though the negative predictive value was lower at 53.85%.

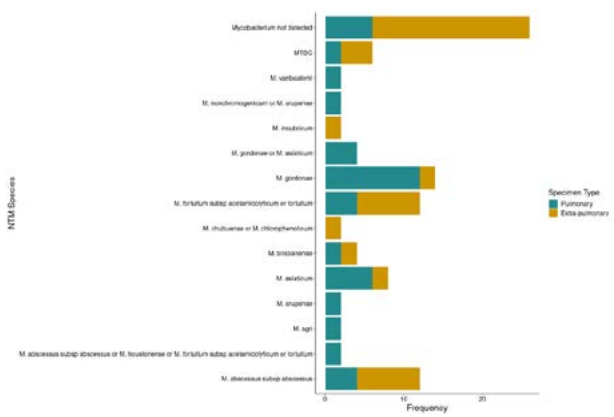

Figure 1.

Conclusions: This study highlights the added utility of *rpoB*2 Ct values from the GeneXpert Ultra assay for screening NTMs in GeneXpert-negative cases, enhancing diagnostic efficiency without additional cost.
The findings emphasize the need for confirmatory molecular and culture-based testing to accurately identify NTMs and guide appropriate treatment. Incorporating *rpoB* screening into routine GeneXpert workflows offers an improvement for NTM identification.

OA01-107-18 Speciation, antimicrobial resistance and virulence factors of clinical isolates of non-tuberculous mycobacteria from a tertiary care hospital in South India

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Background: Accurate and rapid identification of non-tuberculous mycobacteria (NTM), along with drug resistance and virulence factors, is crucial for effective NTM patient management and control, especially in TB-endemic regions.
The aim of our study was to speciate and identify the mechanism(s) of drug resistance and virulence factors in clinical isolates of NTM.
Design/Methods: A total of 840 NTM suspected clinical samples were included in this study. All samples that were found to be GeneXpert negative and NTM-RT PCR positive were cultured in MGIT 960 system. The MGIT cultures that were positive for acid-fast bacilli and MPT64 antigen negative were speciated using line probe assay and MALDI-TOF. After speciation, GenoType NTM-DR and phenotypic drug susceptibility testing (DST) by micro broth dilution were performed to detect drug resistance. We assessed colony morphology and biofilm-forming ability of NTM species using Trypticase-soy agar and 96-well microplates, respectively.
Results: Of the total 840 samples, 56 (6.67%) were found to be positive for NTM species. *M. abscessus* (42.8%) was the most common NTM species followed by *M. fortuitum* (26.7%), *M. intracellulare* (23.2%), *M. chelonae* (3.57%) and *M. mageritense* (3.57%). Based on GenoType NTM-DR assay, 10.71% of *M. abscessus* strains were found to be resistant to clarithromycin, while *M. intracellulare* and *M. chelonae* were sensitive to both amikacin and clarithromycin.
All the NTM strains were sensitive to amikacin by DST. Biofilm formation was predominantly observed in *M. abscessus* (28.5%), followed by *M. fortuitum* (19.6%) and *M. intracellulare* (5.3%). Smooth and rough morphotypes were observed among 26.7% and 16.07% of *M. abscessus* strains, respectively.

Conclusions: The common NTM species isolated from our hospital were *M. abscessus*, *M. fortuitum* and *M. intracellulare*. We observed clarithromycin resistance only in *M. abscessus*. Rapid and accurate detection of drug resistance in NTM species would help clinicians initiate appropriate treatment, increasing the chance of a successful outcome.

OA01-108-18 Baseline EQ-5D-5L improves prediction of treatment discontinuation in non-tuberculous mycobacterial pulmonary disease: Analysis from a nationwide cohort study

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Background: Premature treatment discontinuation of non-tuberculosis mycobacterial pulmonary disease(NTM-PD) treatment is a critical problem that can impact long-term health outcomes. Health-related quality of life(HRQOL) is often impaired in NTM-PD patients, but the relationship between HRQOL metrics and treatment outcomes remains poorly understood.
Design/Methods: 180 patient data from the NTM-KOREA prospective cohort study with follow-up visits at approximately 6-month intervals since treatment initiation were included in our analysis.
Participants completed EQ-5D-5L questionnaires at each visit and quality-adjusted life years(QALYs) were estimated using the Korean value set. After the third follow-up, the patients were categorized into three groups: "culture-conversion achieved", "culture-conversion failed w/maintained treatment", and "treatment halted" groups.
Kruskal-Wallis tests and ANCOVA were used to assess the differences in outcomes between the groups. We developed two binary logistic regression models to predict treatment discontinuation at 18 months:
1. Baseline model including age, sex, smoking history, cavity presence, BMI, and ESR levels, and;
2. QALY-added model. Models underwent 5-fold cross-validation to assess performance.
Results: Among enrolled participants, those who prematurely discontinued treatment demonstrated lower baseline EQ-5D-5L utility scores compared to patients who completed treatment. Adding baseline EQ-5D-5L improved the model's ROC-AUC from 0.628 to 0.697(cross-validated AUC:0.483±0.113 vs. 0.595±0.149), while further adding 6-month QALY updates provided no additional advantage (AUC:0.694). The QALY-added model maintained high sensitivity (0.870±0.083) but with limited specificity (0.323±0.099) in predicting treatment discontinuation at the 0.2 threshold level.

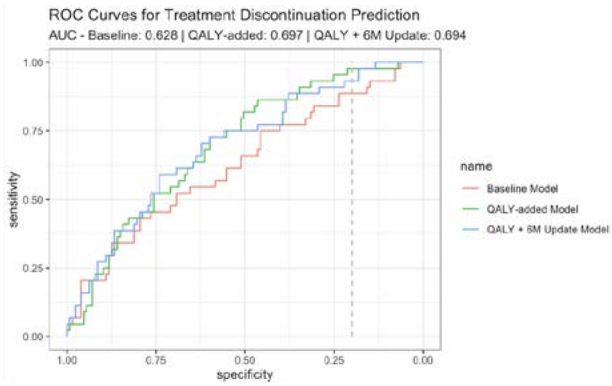

Figure.

Conclusions: Despite modest overall predictive power, EQ-5D-5L scores improve the identification of NTM-PD patients at-risk for treatment discontinuation. This brief patient-reported measure requires no follow-up assessments and is less burdensome than disease-specific instruments like QOL-B. Patients identified to be at-risk for premature treatment discontinuation may require enhanced side-effect monitoring, more frequent follow-up, or adjusted treatment regimens.
Future research should focus on determining clinically meaningful EQ-5D-5L thresholds and validating these findings in external cohorts to facilitate routine clinical implementation.

OA01-109-18 Phage-derived endolysins as anti-microbial agents against multidrug-resistant *Mycobacterium abscessus* clinical isolates

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Background: *Mycobacterium abscessus* (*M. abscessus*), a drug-resistant nontuberculous mycobacteria, poses significant treatment challenges. Phage-derived endolysins are emerging as potential alternatives due to their rapid lytic activity and bacterial specificity.
Mycobacteriophages typically encode multiple endolysins to degrade the structurally complex and hydrophobic mycobacterial cell envelope: Lysin A hydrolyzes peptidoglycan, while Lysin B functions as a lipase or esterase,

cleaving the linkage between the mycolic acid-rich outer membrane and arabinogalactan, thereby releasing free mycolic acids.
Design/Methods: To explore the therapeutic potential of phage-derived endolysins, a lytic mycobacteriophage targeting *M. abscessus* clinical isolate was isolated and whole genome-sequenced. Based on functional annotation, *lysA* and *lysB* genes were identified, cloned, and expressed in *Escherichia coli*. The purified proteins' enzymatic activities were assessed. To evaluate their lytic activity against *M. abscessus* clinical isolates, minimum inhibitory concentration (MIC) and growth inhibition assay were performed.
Results: Lysin A exhibited dose-dependent lysozyme activity when tested using *Micrococcus lysodeikticus* as a substrate, supporting its peptidoglycan-degrading function. Lysin B showed dose-dependent lipolytic activity, as evidenced by the release of p-nitrophenol from p-nitrophenyl butyrate. Growth inhibition assay revealed that both endolysins exhibited bacteriolytic activity against multidrug-resistant *M. abscessus* clinical isolates, with significantly increased activity observed against rough morphotypes compared to smooth colony types. Lysin A inhibited bacterial growth at concentrations up to 7.0 μM, while Lysin B exhibited superior effectiveness, achieving inhibition at a MIC of 0.125 μM.
Conclusions: Our findings demonstrate the potential of phage-derived endolysins as alternative antimicrobial agents against multidrug-resistant *M. abscessus* clinical isolates. Both endolysins showed in vitro bacteriolytic activity, and further research is needed to evaluate their therapeutic applicability.

OA02 Life after TB

OA02-110-18 Quantifying lifetime mortality burden following active tuberculosis: A matched cohort study in Taiwan

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Background: Survivors of active tuberculosis faced increased long-term mortality risk compared to individuals without tuberculosis. There was limited evidence on the excess lifetime mortality burden among individuals with tuberculosis, using a large cohort with long term follow up.
Design/Methods: We used a matched cohort design with survival extrapolation to estimate lifetime years of life lost due to active tuberculosis. The study was nested within a large private health screening program involving over 0.6 million individuals in Taiwan. Individuals with newly diagnosed active tuberculosis between January 1, 2006 and December 31, 2020 were identified through linking the data with National Tuberculosis Registry. Using a risk set matching approach, tuberculosis cases were matched to controls (1:3 case-to-control ratio) from the same screening program.
Coarsened exact matching was performed, matching on age, sex, body mass index, education level, smoking, alcohol, and comorbidities. Survival extrapolation methods were then applied to estimate survival curves and lifetime years of life lost (YLL) due to active tuberculosis.
Results: The matched cohort included 1,874 individuals with active tuberculosis and 5,262 matched controls. Among the TB cases, the mean baseline age was 63.5 years, with a median follow-up time of 7.0 years (Q1: 3.1, Q3: 11.5). Among the matched controls, the mean baseline age was 62.2 years, with a median follow-up time of 9.2 years (Q1: 4.8, Q3: 12.7).
The estimated remaining life expectancy from the time of active TB diagnosis was 20.2 years (95% confidence interval: 15.1-21.5) for TB cases and 27.5 years (95% confidence interval: 22.5-31.0) for matched controls, corresponding to a lifetime YLL of 7.3 years due to active tuberculosis.
Conclusions: We estimated the lifetime YLL associated with active tuberculosis in the intermediate burden setting of Taiwan. Future work incorporating nonfatal health loss will enable a more comprehensive assessment of the lifetime burden of active tuberculosis.

OA02-111-18 Tuberculosis recurrence and associated factors: A 12-year retrospective cohort study in Brazil

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Background: Recurrences comprise a substantial proportion of the global TB burden, particularly in high-prevalence settings and among people living with HIV (PLHIV). In Brazil, a high TB-burden country, recurrence remains challenging and is associated with poor outcomes. São Paulo accounts for ~25% of TB cases nationally. Better recurrence estimates are essential to guide control strategies.
Design/Methods: We conducted a retrospective cohort study using TBweb, São Paulo's TB surveillance system, including individuals with a first TB episode and treatment success between 2013 and 2024. Participants were followed from treatment completion until the first recurrence, death, or administrative censoring. The primary outcome was primary recurrent episode. Date of death was ascertained via linkage with the National Mortality Database (SIM) and treated as a competing event. We applied a Fine and Gray competing risks model to estimate the cumulative incidence of recurrence and identify risk factors, expressed as subdistribution hazard ratios (SHRs) with 95% confidence intervals.
Results: Of 154,579 individuals, 107,646 (69%) were male, 149,356 (97%) aged ≥15 years, and 9,493 (7%) were HIV-positive. Over 12 years, 9,464 (6%) experienced TB recurrence. Median time to recurrence was 27.7 months (IQR:10.8-53.9), and longer in those <15 years (36.1; IQR:15.1-64.7) than in adults (28.1; IQR:10.8-53.9). Females had shorter time to recurrence (22.2; IQR: 8.8-46.4) than males (29.6; IQR:11.7-55.7).
Among PLHIV, median time was 23.6 months (IQR:9.8-49.4) vs. 28.8 (IQR=11.2-54.6) in HIV-negative. All comparisons p<0.001.
In our multivariable analyses, TB recurrence was associated with male sex (SHR:1.23; 95%CI:1.16-1.30), HIV (SHR:2.10; 95%CI=1.97-2.26), incarceration (SHR:2.02; 95%CI:1.91-2.13), homelessness (SHR=2.06; 95%CI=1.85-2.29), alcohol use (SHR:1.25; 95%CI:1.17-1.33), drug use (SHR:1.23; 95%CI=1.08-1.37), tobacco use (SHR:1.14; 95%CI:1.0-1.20), treatment interruption (SHR=1.91; 95%CI:1.74-2.10). Extrapulmonary TB was associated with lower risk (SHR:0.53; 95%CI=0.53-0.57).

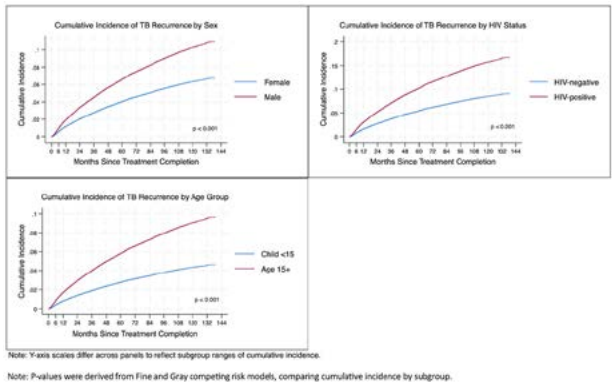

Figure 1. Cumulative incidence function of tuberculosis recurrence, accounting for competing risk of death.

Conclusions: Long-term risk of recurrence highlights the importance of risk-tailored post-treatment follow-up strategies to reduce long-term TB burden, particularly among individuals with persistent biological and social vulnerabilities.

OA02-112-18 Long-term mortality causes of tuberculosis in Korea: A population-based matched cohort study

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Background: Individuals surviving from tuberculosis (TB) exhibit significantly higher mortality rates following treatment relative to those without TB. However, there lacks clear understanding on specific causes and relative risks associated with post-TB mortality. Using the K-TB-N cohort data, our study examined the factors associated with long-term mortality and provide insights on specific causes of death among TB survivors.
Design/Methods: We conducted a retrospective case-control study using the K-TB-N cohort, a linked South Korean national database of TB notification (N=441,989), health insurance claims, and cause of death statistics with 4% random sample of the general population. We constructed our study cohort of 129,785 drug-susceptible TB patients aged ≥20 years from 2012 to 2021, and 1:5

age- and sex propensity score matching matched controls (N=648,332). Cox regression analysis was performed to identify mortality risks. The ranking of mortality rates by cause of death was calculated among the 60 causes of death listed in the general classification table provided by the Cause-of-Death Statistics.

Results: The overall mortality rate was 39.0 in TB versus 16.1 in the age- and sex-matched control cohort per 1,000 person-years ($p < .001$) after a median follow-up period of 72 months from the TB treatment start date. After adjusting for mortality-associated confounders, TB patients had a 2.7-fold higher risk of all-cause mortality (adjusted hazard ratio [HR], 2.7; 95% confidence interval [CI], 2.7–2.8). Within the first twelve-months following diagnosis, TB itself was the leading cause of death among TB patients. In the subsequent years, cancer (lung and bronchus), pneumonia, and cerebrovascular disease were dominant causes of death in the TB population.

Figure 1. Top 10 Causes of Death by Follow-up Period Based on Cause-of-Death Statistics from Statistics Korea

Conclusions: TB survivors face considerably higher mortality risks relative to the general population. Our study provides insights onto key contributing causes of long-term mortality associated with TB and emphasizes the need for integrated management comorbidities of during and post-TB treatment.

OA02-113-18 Restrictive lung disease and abnormal diffusing capacity are more frequent than airflow obstruction in Ugandans post-TB

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Background: A meta-analysis among TB survivors found that 47% have abnormal spirometry and that people with HIV (PWH) have a lower prevalence of post-TB lung disease (PTLD) than people without HIV. Currently, data on the prevalence of abnormal total lung capacity (TLC) and diffusing capacity for carbon monoxide (DLco) after TB is sparse.

Our objective was to perform full pulmonary function testing (PFTs) after TB to determine the prevalence of abnormal lung function and whether this is modified by HIV status.

Design/Methods: This was a prospective study of adults (>18 years) with and without HIV in Kampala, Uganda who had PFTs within 3 months of TB treatment completion. Tests meeting American Thoracic Society/European Respiratory Society criteria for acceptability and reproducibility were included.

The Global Lung Initiative (GLI) reference equations for spirometry (GLI-Global), TLC, and DLco were used, and abnormal tests were defined using the lower limit of normal (LLN). The impact of HIV was analyzed using logistic regression adjusted for smoking and biomass fuel exposure.

Results: 381 participants (32.3% PWH) underwent spirometry (Jan 2016-present). Among those, 120 (40.0% PWH) had lung volumes and DLco in addition to spirometry (October 2021-present).

Spirometry only: Using only spirometry, 200 (52.5%) had normal spirometry, 51 (13.4%) had obstruction, and 129 (34.0%) had a restrictive spirometry pattern (RSP), preserved ratio impaired spirometry (PRISm), or both.

Full PFTs: Among patients who underwent full PFTs, both abnormal TLC (30.0%) and abnormal DLco (29.2%) were more prevalent than obstruction (14.2%), and the patterns of lung function abnormalities were more complex. HIV was associated with significantly lower adjusted odds of airflow obstruction, RSP, and PRISm.

Conclusions: Using full PFTs, the abnormal lung function patterns observed after TB are complex, and both restrictive lung disease and abnormal DLco are more frequent than airflow obstruction.

OA02-114-18 Looking beyond active disease: Burden and characteristics of post-TB lung disease among TB household contacts in Southern Africa

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Background: Post-TB lung disease (PTLD) affects 50% of pulmonary TB survivors post treatment completion. The greatest burden is experienced in high-incidence, low-income settings. Sequalae include respiratory symptoms, functional impairment and structural lung damage. Evidence describing who is most likely to develop PTLD and duration of impairment is limited.
Design/Methods: Secondary data analysis was conducted from a longitudinal cohort study of TB household contacts (HHC) in Zimbabwe, Mozambique and Tanzania. 1488 HHCs (≥18 years) of confirmed (medium/high Xpert MTB/RIF) people with TB were enrolled (2021–2024). Procedures included questionnaires, symptom screen, spirometry, HIV testing and CXR.
Descriptive statistics and chi-squared testing were utilised to compare characteristics of HHC with and without previous TB. Logistic regression adjusting for confounders was used investigate the association of previous TB with impaired post-bronchodilator spirometry utilising GLI-other. Poverty was defined as <USD$1.9 household income per day.
Results: High-quality spirometry data was available for 68.7% of HHC (n=1022). The majority (65.6%) were female, median age was 33.4 years (IQR 24.1–44.4), 12.7% (n=130) had evidence of previous TB (median 9 years (IQR 3-15.5) before enrolment). HHC with previous TB had a higher prevalence of impaired spirometry compared to those without (50.6% versus 30.6%, aOR 2.51, 95% CI1.6-4.0, P<0.001). Despite this, only 8.5% stated a history of lung disease.
After adjustment for age, sex, BMI, and HIV status, HHC with previous TB had 2.9 times higher odds of impaired spirometry (95%CI 1.7–4.7, P<0.001) compared to those without previous TB. The effect size was larger (aOR 3.7 ; 95%CI 2.1–6.4, P<0.001) when additionally adjusting for poverty, as a potential effect modifier.
Conclusions: Previous TB is a major risk factor for persistent pulmonary impairment. PTLD remains under-diagnosed and under-treated with consequences of ongoing health-seeking and income loss. Our data emphasises the need for preventive strategies and tailored interventions.

OA02-115-18 Cured yet struggling: The lingering impact of tuberculosis on mind and life

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Background: Tuberculosis (TB) remains a major global health burden, with 10.6 million cases and 1.3 million deaths reported in 2022. The rise of multidrug-resistant TB (MDR-TB) complicates treatment and control efforts. Tuberculosis (TB) survivors often suffer from long-term mental health issues and reduced quality of life (QoL), yet these outcomes remain insufficiently addressed in post-treatment care.
This systematic review aims to assess the burden of depression and QoL impairments among adults who have completed TB treatment using a structured PICO framework.
Design/Methods: A systematic review was conducted following PRISMA guidelines. Literature was identified through comprehensive searches in PubMed (n=13), Scopus (n=31), and Web of Science (n=18), yielding a total of 62 studies. After screening and applying inclusion criteria, six studies were included in this synthesis. The review focused on adults (≥18 years) with a history of completed TB treatment (P), assessing exposure to TB disease (I), with or without comparator groups (C), and outcomes including prevalence/severity of depression, risk factors, and QoL impacts (O). Only peer-reviewed studies using validated tools were included.
Results: Across 06 Studies, depression prevalence ranged from 13% to 65%; anxiety was reported in 54%, and 9% experienced suicidal ideation. Tools used included CES-D and EQ-5D-3L. Despite 98% reporting some improvement in QoL post-treatment, residual impairments were common: 33% reported persistent dyspnoea, and 26% had reduced exercise capacity. Psychosocial factors such as stigma, isolation, and economic burden contributed to poor mental health, yet structured psychological care was notably absent.

Conclusions: Depression and diminished QoL are highly prevalent among TB survivors. Mental health screening and psychosocial support should be integrated into post-TB care, particularly in resource-limited settings.
Recognition of these long-term consequences is essential for effective TB control and survivor rehabilitation strategies.

OA02-116-18 Beyond the cure: The link between food insecurity and disability in recent tuberculosis survivors in Uganda

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Background: Food insecurity is linked to tuberculosis (TB) through a malnutrition pathway leading to progression to active TB disease and poor treatment outcomes. The effect of food insecurity on overall health and well-being post-TB treatment is understudied.
We examined the relationship between food insecurity and self-reported disability among TB survivors.
Design/Methods: In a cohort study, we enrolled adults ≥18 years who completed TB treatment within 4 weeks in Kampala, Uganda. Questionnaires were administered at baseline, 4, and 8 weeks. We used three questions from the Food Insecurity Experience Scale.
Food insecurity was present if "Yes" to ≥1 question during any visit. Severe insecurity was defined as "Yes" to all three questions; persistent insecurity was "Yes" to ≥1 question in ≥2 visits.
Disability was measured using 12 items from the WHO Disability Assessment Schedule across six domains: cognition, mobility, self-care, getting along, life activities, and social participation (1 = none to 5 = extremely/cannot do).
Disability was categorized as "No" if the score was one and "Yes" if greater than one on any item at any visit. Severe disability was defined as reporting 'Extreme or cannot do' on at least one item at any visit. Univariate and multivariable analyses were conducted.
Results: We analyzed 150 participants who had completed all three visits. The median age (IQR) was 37 (28 - 46) and 53% were female. The prevalence of overall food insecurity, persistent food insecurity and severe food insecurity 71%, 50% and 29% respectively. The prevalence of any self-reported disability in was 90% while severe disability was 29%.
Persistent and severe food insecurity were significantly associated with severe disability (**AOR 2.53**, 95% CI 1.37-4.69 & **1.88**, 95% CI 1.13, 3.14) after adjusting for age, sex and income.
Conclusions: The findings highlight the need for nutritional support as part of the post-TB care continuum.

OA02-117-18 Multimorbidity and the risk of post-tuberculosis lung functional impairment: A systematic review and meta-analysis

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Background: Post-tuberculosis lung disease (PTLD), a chronic respiratory syndrome affecting up to 87% of tuberculosis (TB) survivors, is an emerging public health threat in high TB-burden, low- and middle-income countries (LMICs). The prevalence of multimorbidity, defined as two or more co-existing chronic health conditions, is increasing in LMICs but it is unclear how this affects the risk of PTLD. This systematic review aimed to explore if multimorbidity affects the risk of PTLD.
Design/Methods: We systematically searched Medline, EMBASE, Web of Science, Global Health, and Scopus databases up to 7th March 2024. Studies in LMICs assessing PTLD using spirometry (the most used tool for diagnosing PTLD) and either a single co-morbidity or multimorbidity present together with TB were included. Random effects meta-analyses were performed where data were sufficient.
Results: 10,321 papers were screened and 20 met the inclusion criteria. PTLD prevalence was 14-91%. No studies specifically analysed multimorbidity. The odds of PTLD were reduced in adults living with HIV (odds ratio (OR) 0.68 (95% confidence interval (CI) 0.52-0.88); 10 papers) (figure 1). There was no evidence for an association between PTLD and the presence of diabetes (1.29 (0.94–1.78); 3 papers), but its effect may vary by spirometry pattern. Undernutrition (BMI <18.5) increased the odds of PTLD in adults (1.99 (1.02-3.87); 3 papers) and in children (8.30 (2.0-35.2); 1 paper). Lack of studies or variability in co-morbidity definition prevented evidence synthesis for other co-morbidities.

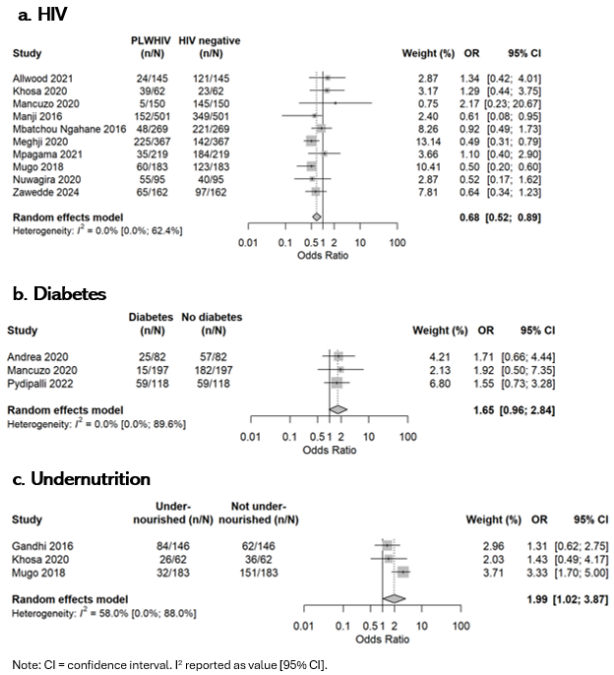

Figure 1: Forrest plots of association of abnormal spirometry in adults according to. HIV status, b. diabetes mellitus, and c. undernutrition.

Conclusions: We found an association with increased odds of PTLD in adults who are HIV-negative or undernourished. Research into the effect of other co-morbidities is critically needed.

OA02-118-18 Prevalence and predictors of post-tuberculosis lung disease among people living with HIV in Pune, India

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Background: Post-tuberculosis lung disease (PTLD) is not well characterized in people living with HIV (PLHIV), particularly in high TB burden settings. We evaluate the prevalence and predictors of PTLD in Indian PLHIV.
Design/Methods: We analyzed baseline data (January 2023–October 2024) from an ongoing lung health cohort at BJ Government Medical College, Pune, India.
Participants were categorized into four mutually exclusive outcome groups based on spirometry and TB history:
Group1: normal spirometry, no TB;
Group2: normal spirometry, post-TB;
Group3: abnormal spirometry, no TB, and;
Group4 (PTLD): abnormal spirometry, post-TB.
Abnormal spirometry included obstructive (FEV1/FVC <5th percentile) **or** restrictive (FVC <5th percentile with normal FEV1/FVC) patterns on pre-bronchodilator testing, using race-neutral 2012 Global Lung Initiative equations. Sociodemographic, HIV-related, smoking-related, and air pollution-related factors were assessed as predictors. Multinomial logistic regression was used to estimate associations between predictors and outcome groups, with odds ratios converted to prevalence ratios (PRs).
Results: Among 456 participants, 26% (n=121) had normal spirometry without prior TB (**Group1**), 10% (n=47) had normal spirometry post-TB (**Group2**), 44% (n=200) had abnormal spirometry without prior TB (**Group3**), and 19% (n=88) met criteria for PTLD (**Group4**).
Among those with PTLD, 81% had restrictive spirometry patterns. Relative to Group1, Group3 was associated with higher viral load, being underweight, and employment, while Group4 was associated with longer antiretroviral therapy duration, being overweight/obese, and employment (Table 1).

	Reference outcome: Group1[1] Comparator outcome: Group2 Adjusted[2] PR (95% CI)	Reference outcome: Group1[1] Comparator outcome: Group3 Adjusted[2] PR (95% CI)	Reference outcome: Group1[1] Comparator outcome: Group4 (PTLD) Adjusted[2] PR (95% CI)
Age (years)	1.05 (1.01, 1.08)	1.01 (0.98, 1.03)	1.01 (0.98, 1.04)
CD4 count/100 (cells/mm^3)	0.81 (0.69, 0.95)	1.00 (0.91, 1.10)	0.98 (0.87, 1.10)
Antiretroviral therapy (ART) duration (years)	1.11 (1.02, 1.20)	0.97 (0.92, 1.02)	1.11 (1.04, 1.19)
Viral load			
<=200 copies/mL	Ref	Ref	Ref
>200 copies/mL	1.02 (0.09, 12.13)	6.17 (1.35, 28.28)	3.80 (0.67, 21.34)
BMI categories (Asian Indians)			
Normal (≥18.5 & <23.0)	Ref	Ref	Ref
Underweight (<18.5)	2.21 (0.70, 7.00)	3.18 (1.37, 7.38)	1.72 (0.64, 4.58)
Overweight & obese (≥23.0)	0.71 (0.31, 1.60)	0.76 (0.44, 1.34)	0.50 (0.26, 0.97)
Employed			
No	Ref	Ref	Ref
Yes	1.54 (0.60, 3.96)	2.22 (1.19, 4.12)	3.44 (1.52, 7.78)

Only significant covariates in the adjusted model are shown.
[1]Group1: Normal spirometry, no TB; Group2: Normal spirometry, post-TB; Group3: Abnormal spirometry, no TB; Group4 (PTLD): Abnormal spirometry, post-TB
[2] Adjusted for age, sex, BMI, CD4 counts, viral load, employment, smoking status and duration on ART.

Table 1: Prevalence ratios (PR) and 95% confidence intervals (CI).

Conclusions: Approximately one-fifth of PLHIV had PTLD. Longer ART duration and employment were positively associated with PTLD, whereas higher BMI was negatively associated with PTLD.
In contrast, abnormal spirometry without prior TB was associated with higher viral load, underweight status, and employment. These findings suggest that correlates of post-TB and non-TB-related lung abnormalities may differ in PLHIV, indicating the value of larger longitudinal studies to better clarify underlying mechanisms for each.

OA02-119-18 Interplay between biological & social vulnerability and poor TB treatment outcome in Brazil: A nationwide study of disease registry data

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Background: A focus on socially vulnerable sub-populations at increased risk oftuberculosis is warranted to decrease the disease burden. In this study, we evaluatedwhether homelessness, living withHIV, incarceration, pregnancy, immigration, drug use, and healthcare work are risk factors for unfavorable anti-tuberculosis treatment (ATT) outcomes in Brazil through analysis of national disease registry data (SINAN).

Design/Methods: We conducted an observational study of tuberculosis cases >18 years-old reported to the SINAN between 2015 and 2023. Clinical and epidemiologic variables were compared between groups (non-vulnerability, homeless, people deprived of their liberty, pregnant women, people with HIV, people who use drugs, immigrants and healthcare worker).

Additionally univariate comparisonswere employed to identify characteristics most common in those with a composite unfavorable ATT outcome, or specifically deathor LTFU. Multivariate modelling with Excess risk due to interactions (RERI) were calculated to estimate how the co-occurrence of vulnerabilities further increasesthe riskof unfavorable outcomes.

Results: Homelessness had the highest frequency of unfavorable ATT outcomes in theoverall population, followed by living with HIV and drug use. Unfavorable outcomes were also common among pregnant and immigrant populations. Living with HIV was the main risk for death, whereas homelessness was the major risk factor for LTFU. Furthermore,drug abuse further increased the risk of unfavorable outcomes among those living with HIV, with a RERI of 225% [174–304%]. Directly observed treatment (DOT), incarceration,and healthcare work were associated with favorable outcomes.

Interactions	Odds Ratio [95% CI]	RERI
	Social Vulnerabilities	
Tobacco Use & Alcohol Use		**0.1 [0.04 - 0.17]**
Effect of Tobacco Use Among Non-Alcohol Users (A+ | B−)	1.35 [1.28 - 1.43]	
Effect of Alcohol Use Among Non-Tobacco Users (B+ | A−)	1.5 [1.41 - 1.59]	
Effect of Tobacco Use Among Alcohol Users (A+ | B+)	1.3 [1.23 - 1.38]	
Effect of Alcohol Use Among Tobacco Users (B+ | A+)	1.44 [1.36 - 1.53]	
Combination Tobacco Use & Alcohol Use	1.95 [1.82 - 2.09]	
Not PPL & Retreatment		**2.25 [1.74 - 3.04]**
Effect of Not PPL Among New Cases(A+ | B−)	1.78 [1.73 - 1.83]	
Effect of Retreatment Among PPL (B+ | A−)	1.59 [1.28 - 1.98]	
Effect of Not PPL Among Retreatment (A+ | B+)	2.9 [2.78 - 3.02]	
Effect of Retreatment Among Not PPL(B+ | A+)	2.6 [2.1 - 3.21]	
Combined Not PPL & Retreatment A+ & B+	4.62 [3.73 - 5.71]	
Not PPL & Immigrants		**0.61 [0.08 - 1.02]**
Effect of Not PPL Among Non-Immigrants(A+ | B−)	1.78 [1.73 - 1.83]	
Effect of Immigrants Among PPL (B+ | A−)	1.37 [1 - 1.89]	
Effect of Not PPL Among Immigrants (A+ | B+)	1.55 [1.43 - 1.69]	
Effect of Immigrants Among Not PPL(B+ | A+)	2.6 [2.1 - 3.21]	
Combined Not PPL & Immigrants A+ & B+	2.76 [2.53 - 3.02]	
	Biological Vulnerabilities	
HIV & Alcohol Use		**0.45 [0.23 - 0.73]**
Effect of HIV Among Non-Alcohol Users (A+ | B-)	2.99 [2.71 - 3.3]	
Effect of Alcohol Use Among Non-HIV (B+ | A-)	1.5 [1.41 - 1.59]	
Effect of HIV Among Alcohol Users (A+ | B+)	1.32 [1.22 - 1.42]	
Effect of Alcohol Use Among HIV (B+ | A+)	2.63 [2.37 - 2.93]	
Combined HIV & Alcohol Use (A+ & B+)	3.94 [3.49 - 4.45]	
HIV & Drug Use		**1.72 [1.28 - 2.28]**
Effect of HIV Among Non-Drug Users (A+ | B-)	2.99 [2.71 - 3.3]	
Effect of Drug Use Among Non-HIV (B+ | A-)	2.42 [2.22 - 2.63]	
Effect of HIV Among Drug Users (A+ | B+)	2.54 [2.27 - 2.83]	
Effect of Drug Use Among HIV (B+ | A+)	2.05 [1.86 - 2.25]	
Combined HIV & Drug Use (A+ & B+)	6.13 [5.38 - 6.98]	

Table Note: Interaction analysis of overlapping vulnerabilities on unfavourable TB outcomes; additive (RERI) and multiplicative effects reported.

Conclusions: Homelessness, living with HIV and drug use, were strongly associated with unfavorable ATT outcomes in the Brazilian population. The superposition ofinterlacing social and biological vulnerabilities significantly worsened the risk of both death and LTFU in our population.

This study highlights the importance of DOT and the need to provide social protection that could improve TB treatment outcomes among vulnerable populations.

OA03 Innovations in assessing TB transmission across different settings

OA03-120-18 Use of genomic and spatiotemporal correlation for enhanced tuberculosis control in New South Wales, Australia

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Background: Tuberculosis (TB) remains a global public health challenge. Even low TB incidence countries, like Australia, are struggling to achieve ambitious targets to eliminate local TB transmission. Whole genome sequencing (WGS) of *Mycobacterium tuberculosis* facilitates accurate transmission tracking, but its integration into public health response remains limited.
This study conducted spatiotemporal analyses of routinely collected WGS data and assessed its potential value to guide programmatic TB control responses.
Design/Methods: WGS and geolocation data from 2,492 *M. tuberculosis* isolates were examined, representing 94.9% of culture-confirmed cases and 64.0% of all notified TB cases in NSW, Australia (2017–2023).
We performed detailed genomic clustering, assessed genetic and geographic distances between cases, and applied Bayesian dated phylogeny to estimate the likely time of strain introduction.
Results: Most (64.2%) notified TB cases were successfully sequenced and geolocated, with 88.3% of TB cases residing in metropolitan Sydney. The local health districts (LHDs) with the highest case counts were South Western (21.0%) and Western (19.1%) Sydney. WGS identified 106 putative transmission clusters, involving 288 cases (11.7%), with 50% spanning multiple LHDs. Eight large clusters (gre 5 members) were identified, containing 64 cases (2.6%).
The largest cluster (17 members) was caused by a Lineage 1 strain, although most large clusters were caused by Lineage 2 strains; two were isoniazid resistant. There was poor correlation between genetic and geographic distances, which showed some improvement with removal of outliers. Most recent common ancestor (MRCA) estimates suggested recent introduction of strains associated with local transmission. Strain clustering and lineage-through-time analyses revealed temporal patterns of cluster expansion and contraction, with accurate temporal monitoring of large clusters providing a valuable metric of epidemic control.
Conclusions: The findings demonstrate the added value of integrating genomic and spatiotemporal clustering data to inform better targeted interventions pursuing the aspirational goal of "zero local TB transmission".

OA03-121-18 Ungrouped whole genome sequencing isolates: What can it tell us?

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Background and challenges to implementation: Singapore has been conducting universal whole genome sequencing for all isolates of Mycobacterium tuberculosis since November 2020, to identify clusters of transmission that could guide public health actions. However, little is known about the characteristics of isolates that are ungrouped.
Intervention or response: A retrospective cohort study was done on all isolates sequenced from patients who were notified to the National TB Registry from 1 November 2020 to 31 December 2024. A single nucleotide polymorphism (SNP) cutoff of 7 was used to define clusters. Isolates more than 7 SNP apart were defined as ungrouped. The demographic, clinical and bacteriologic characteristics of the ungrouped isolates were reviewed.
Results/Impact: During the 50-month study period, isolates from 5378 unique patients were sequenced. Of these, 4184 (78%) were ungrouped. Of the 4184 cases, majority were male (2495, 60%) and the median age was 53 years (IQR, 35-71).
Majority of cases (4056, 97%) were new cases, with only 3% due to relapse. The proportion of ungrouped isolates was significantly higher among those aged 71 years and above (26%) compared to younger age groups (p<0.001) (Figure 1).

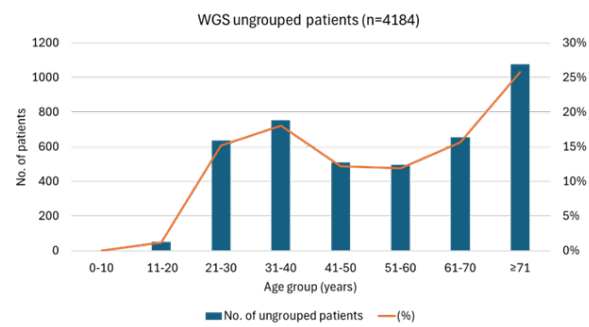

Figure 1.

The most common sites of disease were pulmonary (3515, 84%), followed by lymph node (358, 9%) and pleural (125, 3%). Only 44% (1860) had symptoms of cough, and 63% (2634) were smear-negative. About a quarter (968, 23%) of cases had been diagnosed with diabetes prior to TB diagnosis.

Conclusions: Our study demonstrates that majority of TB cases may be due to reactivation of latent infection, with only about 20% of sequenced cases due to transmission.

As a majority of cases also did not report symptoms of cough, strategies to detect and treat early or pre-disease states in high-risk groups such as diabetics or elderly should be evaluated further.

OA03-122-18 Tuberculosis transmission among older adults in Southern Taiwan

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Background: Tuberculosis (TB) in older adults represents a growing global concern, especially in settings with declining TB transmission and population ageing. TB in older adults is often attributed to reactivation from remote infection.

Few studies have systematically evaluated the role older adults in TB transmission.

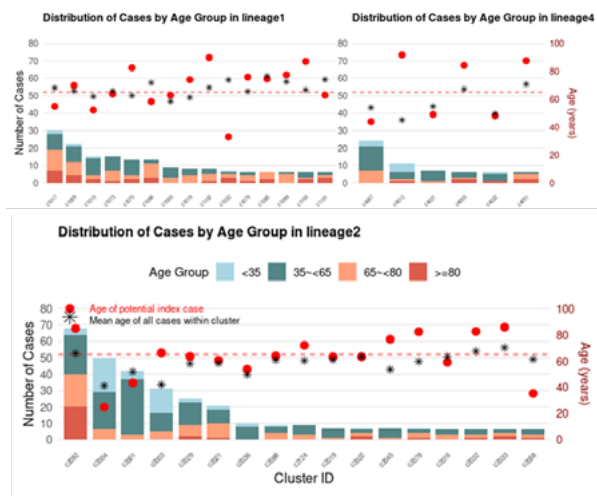
Design/Methods: We analyzed data from a population-based cohort in Kaohsiung, Taiwan, from 2019 to 2023. 4,836 culture-positive TB cases were identified, with 3,787 (82%) undergoing whole genome sequencing. Genomic clustering was defined as ≤20 single nucleotide polymorphisms between isolates. In median and larger clusters (≥6 cases), we used the TransPhylo package to infer transmission pairs and potential index cases.

In smaller clusters (≤5 cases) where the notification dates of cases were at least 3 months apart, we assumed the first notified case as the index case.

Results: Overall, 70.8% of cases were male, and 60.9% were older adults (≥65 years). Of all cases, 38.7% were genetically clustered, with older adults contributing to 49.2% of clustered cases despite having a lower clustering rate (31.3%) than the other age groups.

Notably, older adults were involved in 87.9% of the clusters (≥3 cases), and in 45.5% of the clusters older adults accounted for >50% of the cases. In median and larger clusters (≥6 cases), TransPhylo identified older adults as the index case in 47.4% (18/38).

Among the inferred transmission pairs, 31.1% (61/196) of infectors and 34.6% (73/211) of infectees were older adults. In smaller clusters (3<cases≤5), older adults were the first notified case in 29.9% (38/127).



Conclusions: Our findings suggest that older adults play a significant role in TB transmission not only as recipients but also as potential sources of transmission. Understanding transmission dynamics within this age group and across age groups, particularly in settings with aging populations, is crucial for designing effective, age-targeted control strategies.

OA03-123-18 CAD score of chest radiograph vs. cough as determinants of household *Mycobacterium tuberculosis* transmission risk among people with sputum-positive TB

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Background: If digital chest radiography with computer-aided detection (CAD) software, increasingly used for TB screening, is a better indicator of infectiousness than cough, this would justify its wider use.

To evaluate this, we assessed the association of *Mycobacterium tuberculosis* (*Mtb)* transmission risk to household contacts with:

i. CAD4TB quantitative output and;
ii. Cough status at the start of treatment among index people with tuberculosis (PWTB).

Design/Methods: We recruited programmatic sputum-positive index PWTB starting treatment in uMkhanyakude, a rural/peri-urban district in KwaZulu-Natal, South Africa. Household *Mtb* transmission risk was assessed using QuantiFERON-TB Gold plus (QFT) positivity among household contacts (2-14 years). A Bayesian multilevel multivariable logistic regression model was used to assess the causal association of QFT-positivity with cough status (defined as presence of cough of any duration versus none [Model 1]); CAD4TB score in 10-unit strata (Model 2); and a final model including CAD4TB score and cough status (Model 3). The minimal adjustment set was informed by directed acyclic graphs. Adjusted population attributable fractions (PAF) were calculated.

Results: 603 child household contacts of 243 index PWTB were included in the analysis. After adjustment, there was weak evidence for an association of QFT positivity (OR 3.0: 95% CI1.0 – 10.7) with cough status (Model1, Table), whereas there remained strong evidence for a **40% increase in odds of QFT-positivity per 10-unit increase in CAD4TB score** (Model 2). PAFs were similar for CAD4TB score and cough. Including both cough status and CAD4TB score (Model 3), strong evidence for the association with CAD4TB remained whereas cough status was no longer associated with QFT-positivity.

		Unadjusted	Multivariable		
	Proportion of child contacts QFT+ (n/N)	OR (95% CI)	Model 1[$] OR (95% CI)	Model 2[$] OR (95% CI)	Model 3[$] OR (95% CI)
Cough status of index PWTB					
None	0.11 (19/177)	-	-	-	-
Present	0.19 (82/426)	3.0 (1.2 - 7.9)	3.0 (1.0 - 10.7)	-	1.5 (0.5 - 5.5)
CAD4TB score of index PWTB (per 10-unit increase)	-	1.3 (1.1 - 1.6)	-	1.4 (1.1 - 1.7)	1.3 (1.1 - 1.7)
PAF	-	-	54%	59%	-

OR = odds ratio; CI = credible interval; PAF = population attributable fraction
[$]Minimal adjustment set included index person with tuberculosis characteristics (age, sex, HIV status, history of previous TB), household socioeconomic status and residential area

Table.

Conclusions: CAD4TB score and cough are associated with household transmission risk. CAD scores may be more useful than cough to identify the most infectious PWTB in the community.

OA03-124-18 Household transmission of tuberculosis from smear-negative index patients

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Background: Although smear-negative pulmonary tuberculosis (TB) has traditionally been considered less infectious than smear-positive TB, growing evidence indicates that smear-negative index patients may still contribute substantially to overall disease burden. However, data on transmission from this population remains limited.

We used a household-based cohort in Lima, Peru, to evaluate the contribution of smear-negative index patients to within-household TB transmission, and to identify risk factors that may influence transmission risk from these patients.

Design/Methods: We enrolled 4,044 microbiologically confirmed TB index patients and their 12,767 household contacts (HHCs) in Lima, Peru, between 2009 and 2012. HHCs were followed for 12 months to monitor TB transmission using tuberculin skin testing and to assess disease progression.

We used logistic regression to evaluate associations between index patient characteristics and HHC outcomes, including TB infection and incident disease.

Results: Among 1,134 child household contacts exposed to a smear-negative index patient, 241 (21%) were infected at baseline. Of the 465 contacts of any age who developed secondary disease during follow-up, 115 (25%) had been exposed to a smear-negative patient.

Among child household contacts of smear-negative index patients, baseline infection was more likely when the index patient was female (OR: 1.41, 95% CI:1.04–1.92), had diabetes (OR: 2.83 [1.11–7.21]), or came from a household with lower socioeconomic status (OR: 1.45 [1.04–2.02]).

Exposure to an index patient with a history of active smoking was associated with increased risk of developing secondary incident disease (OR: 3.49 [1.18–10.33]).

	Baseline Child HHC Infection			Secondary TB Disease		
		Univariate	Multivariate (n = 1076)		Univariate	Multivariate (n = 3104)
	No. (%)	OR (95% CI)	OR (95% CI)	No. (%)	OR (95% CI)	OR (95% CI)
Sex						
Female	599 (51.6)	1.340 (1.008 – 1.783)	1.408 (1.028 – 1.927)	1553 (46.4)	1.324 (0.878 – 1.996)	1.261 (0.796 - 1.996)
Male	561 (48.4)	*(referent)*	*(referent)*	1795 (53.6)	*(referent)*	*(referent)*
Age						
16 - 30	751 (64.7)	*(referent)*	*(referent)*	2200 (65.7)	*(referent)*	*(referent)*
31 - 45	285 (24.6)	1.343 (0.974 - 1.852)	1.238 (0.872 - 1.758)	647 (19.3)	2.164 (1.370 - 3.417)	1.874 (1.124 - 3.124)
46 - 60	70 (6.0)	0.993 (0.539 - 1.832)	0.756 (0.353 - 1.621)	281 (8.4)	0.779 (0.308 - 1.970)	0.553 (0.157 - 1.957)
Older than 60	54 (4.7)	0.592 (0.262 - 1.335)	0.464 (0.180 - 1.192)	220 (6.6)	1.623 (0.759 - 3.468)	1.780 (0.704 - 4.503)
HIV Status						
Negative	1129 (98.2)	*(referent)*	*(referent)*	3240 (97.8)	*(referent)*	*(referent)*
Positive	21 (1.8)	0.621 (0.181 - 2.125)	0.496 (0.139 - 1.766)	73 (2.2)	0.475 (0.0653 - 3.457)	0.392 (0.0523 - 2.935)
Diabetes						
No	1111 (96.9)	*(referent)*	*(referent)*	3192 (96.3)	*(referent)*	*(referent)*
Yes	36 (3.1)	1.926 (0.949 - 3.909)	2.826 (1.107 - 7.210)	121 (3.7)	0.586 (0.143 - 2.408)	0.763 (0.154 - 3.790)
Smoking						
No	1121 (98.2)	*(referent)*	*(referent)*	3246 (98.4)	*(referent)*	*(referent)*
Any	20 (1.8)	0.928 (0.307 - 2.800)	0.962 (0.305 - 3.036)	54 (1.6)	3.662 (1.424 - 9.414)	3.491 (1.180 - 10.33)
BCG Scars						
None	182 (15.7)	*(referent)*	*(referent)*	566 (16.9)	*(referent)*	*(referent)*
Any	978 (84.3)	0.806 (0.555 - 1.171)	0.782 (0.515 - 1.188)	2782 (83.1)	1.552 (0.822 - 2.929)	1.763 (0.853 - 3.645)
Body Weight						
Normal Weight	1087 (94.3)	*(referent)*	*(referent)*	3118 (93.7)	*(referent)*	*(referent)*
Underweight	48 (4.2)	1.270 (0.650 - 2.481)	1.812 (0.870 - 3.774)	161 (4.8)	1.662 (0.756 - 3.656)	2.531 (1.034 - 6.197)
Overweight	18 (1.6)	1.088 (0.355 - 3.339)	0.999 (0.301 - 3.311)	47 (1.4)	1.625 (0.388 - 6.812)	1.951 (0.437 - 8.719)
Socioeconomic Score Tertiles						
Lowest third	440 (39.3)	1.435 (1.049 – 1.964)	1.445 (1.035 – 2.018)	1163 (35.9)	1.402 (0.885 - 2.222)	1.279 (0.781 – 2.096)
Middle third	493 (44.0)	*(referent)*	*(referent)*	1413 (43.7)	*(referent)*	*(referent)*
Upper third	187 (16.7)	1.039 (0.677 – 1.595)	0.990 (0.630 – 1.555)	660 (20.4)	0.853 (0.456 – 1.597)	0.807 (0.420 – 1.547)

Conclusions: Smear-negative TB patients accounted for a quarter of within-household TB transmission in our study cohort. Risk factors for TST positivity among HHCs exposed to a smear negative patient included lower socioeconomic status and diabetes in the index patient. These findings highlight the need to consider smear-negative individuals in TB control strategies.

OA03-125-18 Smoked drug use drives tuberculosis transmission dynamics in a rural community in the Western Cape, South Africa

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Background: Smoked drug use may be an underrecognized contributor to *Mycobacterium tuberculosis* (Mtb) transmission. People who smoke drugs (PWSD) have elevated disease burden and contribute disproportionately to transmission due to greater infectiousness (smear-positive sputum, cavitary disease), shared smoking practices in poorly ventilated settings, prolonged periods of transmission potential from delayed diagnosis, more often being young men, and other social dynamics.

Design/Methods: We analyzed *Mtb* whole-genome sequencing data from 452 individuals diagnosed with pulmonary TB between 2017-2024 in a South African rural community. 399 were diagnosed at clinics (clinic-diagnosed), 53 were recruited via respondent-driven sampling (community-diagnosed) among PWSD (methamphetamine and/or methaqualone). We used a <2 single nucleotide variant threshold to define transmission clusters and summarized their size and composition.

We employed a machine learning approach (Naive Bayes with cross-validation) to estimate pairwise transmission probabilities that integrates genetic distance with host characteristics (spatial proximity, demographics, clinical data) and determines directionality from diagnosis date.

We estimated odds ratios and 95% confidence intervals for the contribution of host characteristics to identifying infectors in transmission pairs.

Results: 399 (88.3%) individuals were clinic-diagnosed of whom 180 (45.1%) were PWSD. All 53 community-diagnosed participants smoked drugs. Median participant age was 37 (IQR: 27-47) years, 283 (62.6%) were male, 130 (26.6%) had HIV, 158 (35.0%) had an incarceration history, and 175 (38.7%) had a history of TB. 163 (36.1%) participants linked across 53 transmission clusters; 22 (41.5%) clusters included ≥3 individuals. Most clusters contained PWSD (45/53; 84.9%).

Both PWSD that were clinic-diagnosed (aOR: 2.7, 95%CI: 1.6-4.5) and community-diagnosed (aOR: 5.2, 95%CI: 2.6-10.4) were more likely to be infectors (Figure 1).

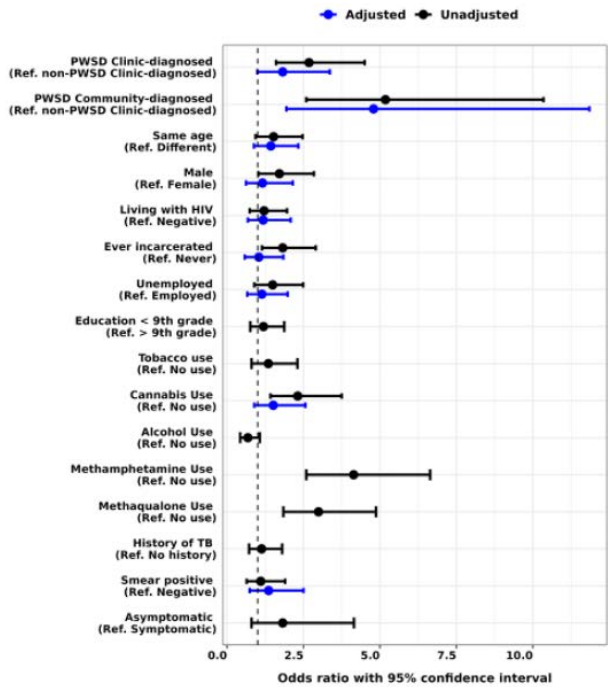

Figure 1. Associations between host characteristics and being an infector in direct transmission pairs.

Conclusions: In a high TB burden setting, PWSD significantly contributed to TB spread via increased odds of being an infector and high membership in transmission clusters. PWSD should be considered for prioritization for early screening and transmission interventions to reduce community transmission.

OA03-126-18 *M. tuberculosis* transmission dynamics in congregate settings: A genomic epidemiology study

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Background: One barrier to intervening in the global tuberculosis (TB) pandemic is that it is unknown whether *M. tuberculosis* transmission largely occurs through repeated close exposures among few contacts or many shorter-term contacts. Identifying sources of transmission is particularly urgent in congregate settings with high incidence of infection.
Design/Methods: To identify drivers of *M. tuberculosis* transmission within a congregate setting with extremely high incidence of TB, we conducted genomic surveillance in a prison system in Central West Brazil. We whole genome sequenced *M. tuberculosis* isolates and collected detailed incarceration histories, including movements between and within prisons.
We investigated the relationship between exposures of differing proximity (cell, cell block, prison) and transmission risk, inferred by genomic clustering.
Results: We collected detailed incarceration histories for 595 individuals from whom we sequenced 561 high quality *M. tuberculosis* genomes. A month-long increase in exposure to an individual with TB within a prison cell increased the odds of pairwise genomic clustering by 7.4% (95% CI: 4.4-10.4%) and a six-month increase in exposure, by 54% (95% CI: 29.9%-82.5%). Most (89%; 528 of 595) individuals with TB had at least one potential week-long exposure in a prison cell to another individual with TB, and frequently many, with a median of 12 (IQR: 5-21) potential unique exposures to individuals in prison cells.
Frequent movements by the prison system create a highly connected contact network: individuals with TB were transferred a median of 5 (IQR: 1-17) times in the 12 months before diagnosis.
Conclusions: While close exposures within a prison were related to pairwise genomic clustering, most individuals with TB had multiple exposures to other individuals with TB due to frequent movements by the prison system. Our results support the urgent expansion of prison-wide mass

screenings, TB preventive therapy, and structural interventions to reduce transmission risk in prisons and other congregate settings.

OA03-127-18 Using whole genome sequencing and other metadata to estimate factors associated with tuberculosis transmission in Lima, Peru

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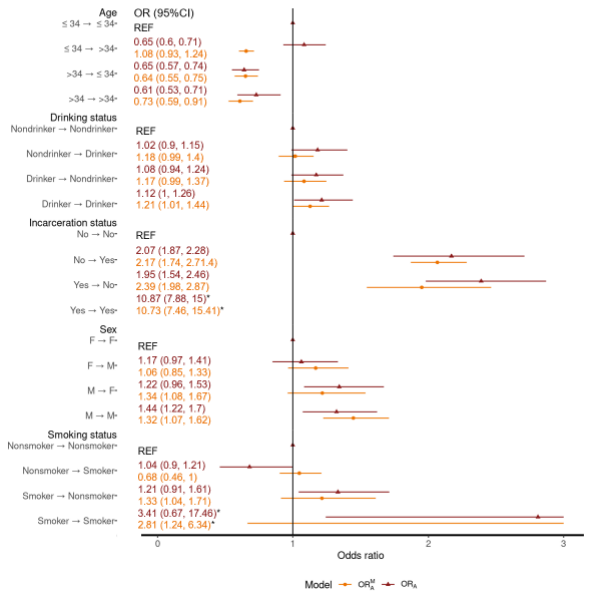
Background: A detailed understanding of tuberculosis (TB) transmission dynamics is necessary to interrupt the spread of disease. We develop a model to estimate adjusted odds ratios (ORs) of factors associated with genetic relatedness, defined by single nucleotide polymorphisms (SNP) differences obtained from whole genome sequencing (WGS), as a proxy for transmission.
Design/Methods: We build upon an existing model that estimates unadjusted ORs between genetic relatedness and pair-level features. The model uses an iterative algorithm to create a dataset approximating true transmission links inferred from SNP differences, shown in prior simulations to better capture transmission-covariate associations than genetic relatedness alone.
To calculate adjusted ORs, we integrated bootstrapped logistic regression within the iterative algorithm, addressing correlation from individuals appearing in multiple pairs. We applied this method to data from a cohort study in Lima, Peru, comparing results to ORs from logistic regression without the iterative framework.
Results: Amongst the 2,488 people diagnosed with TB in the study, we identified 2,481 possible transmission pairs out of 3,078,413 total possible pairs. Transmission pairs in which either the infector or infectee was younger than 35 or was incarcerated and in which both the infector and infectee were male had increased odds of transmission (Figure).
Point estimates from the iterative algorithm were similar to those from logistic regression but had larger confidence intervals, reflecting the adjustment for correlation in the data.
Conclusions: We designed a method to produce adjusted ORs that appropriately account for the correlation of pairwise genetic relatedness data and serve as an accurate proxy for the association of covariates and transmission. This method can be applied to any dataset with WGS and is a valuable tool to further our knowledge of risk factors associated with TB transmission.

Figure. Estimated adjusted naïve Bayes modified close genetic relatedness odds ratios (OR_A^M) and odds ratios estimated by a multivariate logistic regression model (OR_A) for the Lima, Peru cohort dataset. Both estimates are presented with 95% confidence intervals. *The value is out of scale and has not been included or entirely represented.



OA03-128-18 Comparative transmissibility of bacteriologically confirmed versus clinically diagnosed pulmonary TB at school setting: Implications for contact screening strategies

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Background: Tuberculosis infection (TBI) remains a global health challenge. Current WHO guidelines prioritize preventive therapy for contacts of bacteriologically confirmed pulmonary TB (PTB) cases, assuming lower transmission risk from clinically diagnosed cases. This study evaluates this assumption.
Design/Methods: We analyzed data from the TB-YOUTH study (NCT06033807), including 256 PTB index cases (139 bacteriologically confirmed, 117 clinically diagnosed) and 14,786 school-based contacts. TBI was determined via IGRA (QuantiFERON®-TB Gold Plus). Primary outcomes compared TBI rates between contacts of bacteriologically vs. clinically diagnosed cases. Secondary outcomes included active TB (ATB) detection and trans-

mission determinants. Analyses used chi-square tests and generalized linear mixed models (GLMM) to account for clustering effects.

Results: Clinically diagnosed index cases demonstrated higher symptomatic manifestations (overall symptoms: p=0.023; cough: p=0.001; persistent cough >2 weeks: p=0.032) (Table 1). Crude TBI rate was marginally lower in contacts of clinically diagnosed cases in initial chi-square analysis (9.89% vs. 11.14%; *p*=0.01), but GLMM adjustment nullified this association (adjusted OR=1.05, *p*=0.65), with moderate clustering effects (ICC=0.11). Similarly, ATB detection differences (crude *p*=0.010) disappeared after GLMM adjustment with exceptionally high clustering effects (OR=0.94, *p*=0.91; ICC=0.80). Multivariable regression identified male index cases (OR=1.22, *p*=0.046) and prolonged cough (>2 weeks; OR=1.23, *p*=0.049) independently predicted higher transmission risk.

	Bacteriologically Confirmed (n=139)	Clinically diagnosed (n=117)	p
Age	17 [15, 19]	17 [15, 19]	0.381
Female Gender	78 (56.1)	62 (53.0)	0.708
Detected in Active case finding	72 (51.8)	63 (53.8)	0.841
Any Symptom	93 (66.9)	61 (52.1)	0.023
Cough	68 (48.9)	33 (28.2)	0.001
Sustained cough (duration > 2w)	49 (35.3)	26 (22.2)	0.032
Number of close contacts included	56 [50, 64]	56 [50, 63]	0.804

Table 1. Baseline characteristics of index cases
Data are in median [IQR] or n (%). P < 0.05 indicates significant statistical difference. W, week(s).

Conclusions: Our findings suggested that diagnostic classification (bacteriologically vs. clinically confirmed) did not predict TB transmission risk in schools after adjusting for clustering. High ICC values highlight the necessity of multilevel modeling in contact studies. Prolonged cough in index cases correlated with transmission, suggesting symptom-based interventions remain relevant.

These findings challenge the exclusion of clinically diagnosed cases from systematic prevention strategies, but still need to be validated by ATB incidence in prolonged follow-up.

OA03-129-18 Pairwise analyses of transmission among individuals with isoniazid-resistant and pan-susceptible tuberculosis using genomic and spatial data

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Background: The comparative transmission of drug-resistant and drug-susceptible strains of *M. tuberculosis* (*Mtb*) is a key determinant of the projected trajectories of tuberculosis (TB) epidemics.

Few analyses thus far have attempted to estimate and compare factors associated with transmission of drug-resistant and drug-susceptible *Mtb* circulating in the same population.

Design/Methods: We conducted whole-genome sequencing (WGS) using isolates from 3,796 (83%) out of total 4,565 culture-positive TB diagnosed between 2019 and 2023 in Kaohsiung, Taiwan. Genotypic isoniazid-resistant (INH-R) TB was defined using TB-Profiler, identifying 336 INH-R isolates carrying an isoniazid-resistance associated mutation and 3,077 pan-susceptible TB (DS-TB) isolates.

We used a hierarchical Bayesian regression model (implemented in the R package GenePair) to identify epidemiological, genomic, and spatial factors associated with each pair of TB cases belonging to the same putative transmission network (defined here using a threshold of no more than 12 single-nucleotide polymorphisms).

Results: Among pairs with DS-TB, closer spatial proximity, smaller age differences, and younger ages were independently associated with greater odds of being in the same transmission network.

Among pairs with INH-R TB, only closer spatial proximity was associated with greater odds of being in the same transmission network.

The Figure shows effect estimates for variables included in the model.

Conclusions: Our pairwise analyses suggest that person-to-person transmission dynamics differ by drug resistance status, highlighting the need for tailored approaches to TB prevention and care for individuals with *Mtb*.

Demographic and spatial factors appear to play a greater role in the transmission of DS-TB, warranting more targeted efforts in this population.

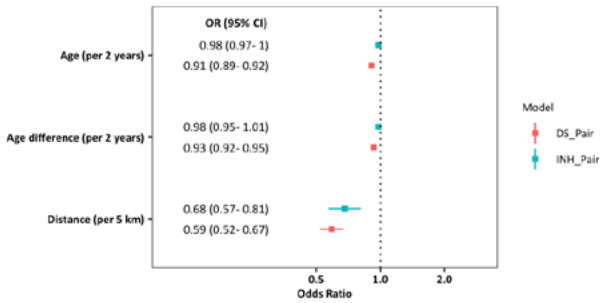

Figure. Odds Ratios for Age and Spatial Factors Associated with TB Transmission in INH-R and DS-TB Pairs.
Note: Age (per 2 years): sum of the ages of two patients per 2 years; Age difference (per 2 years): age difference per 2 years; Distance (per 5 km): spatial distance per 5 km.

OA04 TB and co-morbidities

OA04-130-18 TB multimorbidity and its impact on mortality amongst adults in South Africa: A prospective cohort study nested in a trial

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Background: Tuberculosis (TB) multimorbidity- the co-existence of TB and another comorbidity within a single individual- is a major contributor to TB incidence and mortality. We investigated the prevalence and mortality of TB multimorbidity in South Africa.
Design/Methods: We conducted a prospective cohort study of adults ≥15 years with bacteriologically-confirmed pulmonary TB in two provinces in South Africa, nested within a cluster-randomised trial of household TB contact person investigations. We investigated five TB key comorbidities as defined by the World Health Organization: HIV, undernutrition, diabetes, smoking and alcohol use, and assessed all-cause mortality over 15 months using Cox regression. TB multimorbidity was defined as the presence of one or more concurrent TB key comorbidities in a person with TB.
Results: Of 1997 participants, 1896 (95%) had mortality data available at 15 months. Median age was 38 (IQR 29-48) years, 1203/1997 (60%) were male, and 86.2% (95% CI 84.6-86.6) had TB multimorbidity. TB multimorbidity peaked in participants aged 40-49 years (93% [90-95]), was more prevalent in men vs women (90% [88-91] vs 81% [78-84], p<0.001), and in urban vs rural areas (88% [86-90] vs 84% [81-86], p=0.005).
The prevalence of the five TB key comorbidities were HIV (54.7% [95% CI 52.5-56.9]), undernutrition (44.9% [43.3-47.7]), alcohol consumption (28.3% [26.3-30.3]), smoking (18.4% [16.7-20.2]), and diabetes (3.7% [2.9-4.6]).
Mortality was higher for participants with two (16.0% [13.0-18.8], HR 1.88 [1.20-2.95], p=0.006) and three or more (19.9%[14.9-24.6], HR 2.58 [1.56-4.24], p<0.001) TB key comorbidities, than those with no comorbidities (11.2% [7.17-15.0]) (Figure 1).

The population attributable fraction of TB multimorbidity on mortality was 57.1%.

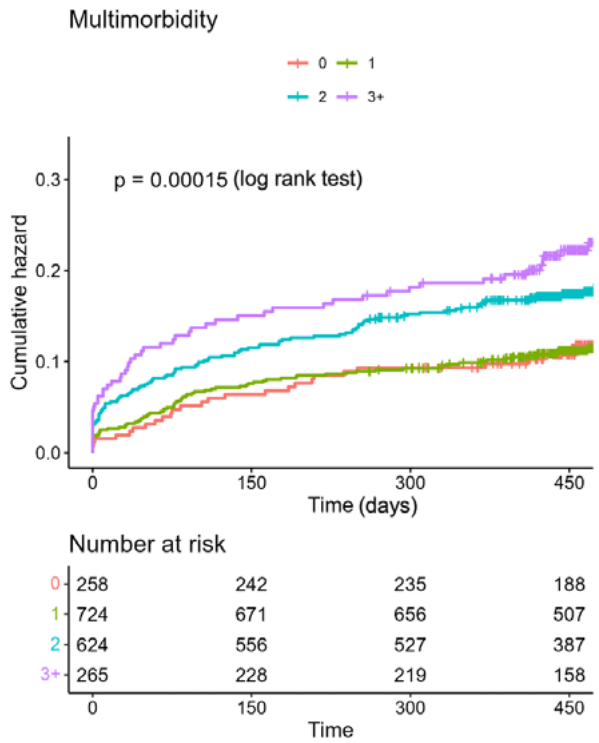

Figure 1.

Conclusions: TB multimorbidity is highly prevalent and a major contributor to TB mortality. People with TB should be routinely offered screening and management of comorbid conditions to reduce their risk of death.

OA04-131-18 Community-based, peer-led psychosocial support was associated with reduced tuberculosis stigma and depression among adults with tuberculosis in Indonesia: A prospective interventional cohort study

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Background: In Indonesia, our recent research demonstrated that 61% of people with tuberculosis (TB) experience moderate TB-stigma and 31% exhibit depression symptoms. Working with key multisectoral stakeholders, we co-developed a community-based, peer-led psychosocial support intervention.
This study evaluated the impact of the intervention on TB stigma and depression among adults with TB in Indonesia.
Design/Methods: A non-randomized, single-arm prospective intervention cohort studywas conducted in six primary health centers and two public hospitals in Depok and Padang cities from June 2024 to February 2025. All newly diagnosed individuals with drug-sensitive and drug-resistant TB, aged 15 years and above, were consecutively recruited. Participants were assessed at diagnosis, end of intensive phase (month-2), and continuation phase (month-6) for stigma, depression, and quality of life, using locally-adapted and validated tools including the Van Rie TB Stigma scale, PHQ-9, and EQ5D5L, respectively. All participants were offered a psychosocial support intervention consisting of individual counselling at baseline, and TB Survivor-led monthly group counselling until treatment completion. We applied McNemar and Cochran's Q tests to evaluate changes from baseline, Month-2 and Month-6.
Results: A total of 129 people (Depok=85, Padang=44) participated. At baseline, 74% (95%CI 65-82%) exhibited moderate TB stigma, primarily related to guilt and disclosure, which decreased to 43% (34-53%) at Month-2 and 21% (13-28%) at Month-6 (p<0.001). Mild to severe depression similarly decreased: 57% (35-72%) at baseline, 33% (20-47%) at Month-2, and 15% (6-23%) at Month-6 (p<0.001). Conversely, quality of life increased over time, with median (IQR) values rising from 0.84 (0.63-1.00) to 0.92 (0.83-1.00) at Month-2 and 1.00 (0.91-1.00) (p<0.001) at Month-6.

Conclusions: Community-based, peer-led psychosocial support, combining individual and monthly group counselling, has the potential to mitigate TB stigma and depression while improving quality of life among adults with TB in Indonesia. A randomised-controlled trial evaluating the effectiveness of the psychosocial support package is in preparation.

OA04-132-18 Association of *Helicobacter pylori* co-infection with tuberculosis disease severity: A cross-sectional study

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Background: *Helicobacter pylori* (HP) has immunomodulatory effects and is highly prevalent among individuals with tuberculosis (TB), but its association with TB disease severity remains unclear. We assessed the association between HP infection and clinical, microbiological, and radiological TB severity. Secondarily, we explored factors associated with HP co-infection.
Design/Methods: We enrolled adults (≥18 years) with newly diagnosed, bacteriologically confirmed pulmonary TB from two public clinics in Kampala, Uganda. TB was confirmed using GeneXpert Ultra or smear microscopy. Participants completed a questionnaire, underwent physical examination, provided stool samples for HP stool antigen testing (SAT), and underwent chest X-rays imaging read by a radiologist.
Severe microbiological TB was defined as GeneXpert cycle threshold <16 or smear grade 3+; severe clinical TB as Bandim TBscore ≥8; and severe radiological TB as X-ray Timika score >71. We used modified Poisson regression to evaluate associations between HP and TB severity, adjusting for confounders.
Results: Of 200 participants, 67 (33.5%; 95% CI 27.3–40.4) tested positive for HP. Severe radiological TB was more frequent in HP-positive participants (34.8% vs. 22.1%, $p = 0.060$), as were severe clinical (14.9% vs. 11.3%, $p = 0.55$) and microbiological TB (40.0% vs. 33.8%, $p = 0.86$), though differences were not statistically significant. In adjusted analysis, HP was not significantly associated with severe clinical (aPR 1.17; 95% CI 0.53–2.60), radiological (aPR 1.51; 95% CI 0.94–2.42), or microbiological TB (aPR 1.14; 95% CI 0.80–1.63). HP infection was independently associated with rural residence (aPR 1.60; 95% CI 1.04–2.47), anorexia (aPR 1.71; 95% CI 1.01–2.90), and lower diastolic blood pressure (aPR 0.98; 95% CI 0.96–0.99).
Conclusions: HP co-infection was not significantly associated with TB severity, although a trend toward increased radiological severity was observed. HP infection was associated with rural residence, anorexia, and lower diastolic blood pressure.

OA04-133-18 Nasal host gene expression in adults with pulmonary tuberculosis and HIV in Uganda

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Background: Tuberculosis (TB) is a major cause of death in those with HIV, however diagnosis remains difficult. The first pathogen-host interaction in TB occurs in the upper airway and nasal samples are easy to collect. This study aimed to determine if nasal gene expression differs in TB disease, compare nasal gene profiles with blood and assess the performance of nasal and blood signatures in predicting TB.
Design/Methods: 40 adults with presumed pulmonary TB (PTB) and newly diagnosed HIV were consecutively enrolled in Uganda: 20 with active PTB disease (cases) and 20 without (controls). Nasal cells and blood were collected for RNA sequencing to identify differentially expressed genes (DEGs) and biological pathways. Receiver operating characteristic curves evaluated the performance of a classification model that used machine learning algorithms. Gene enrichment methods were applied to assess 59 published blood TB diagnostic signatures in the Ugandan blood and nasal datasets.
Results: 44 nasal DEGs and 238 blood DEGs were identified between TB cases and controls, with 3 DEGs common to both samples.
Figure 1 demonstrates the top DEGs. Amongst PTB cases, pathways related to the inflammatory response and innate immune system were downregulated in nasal samples and upregulated in blood. Proportions of immune cell

subtypes in nasal samples were not different based on TB status. Machine learning models trained using all 44 nasal DEGs had an area under the curve (AUC) between 0.85-0.93 for predicting TB, similar to models trained with the 238 blood DEGs (AUC: 0.83-0.95). 6/59 published blood signatures had an AUC>0.7 in the nasal dataset, compared to 46/59 in the blood dataset.

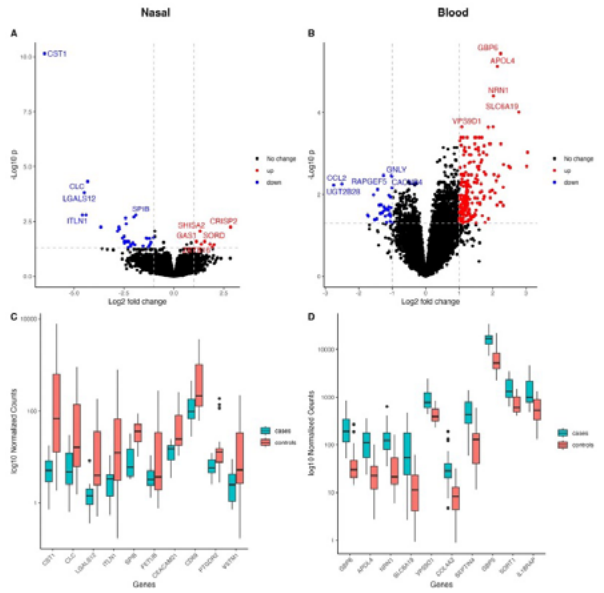

Figure 1: Top DEGs in PTB cases compared to controls
Volcano plot showing the effect size by the -log$_{10}$P value for nasal (A) and blood (B) samples. DEGs are highlighted in red or blue, with gene names shown for the top 5 downregulated and upregulated DEGs.
Boxplot of log transformed normalised counts for the top 10 DEGs for nasal samples (C) and blood samples (D).

Conclusions: This study suggests that there are distinct immune responses to PTB in the nose, compared with blood. Differences in nasal gene expression in adults with HIV who have PTB, versus those without PTB, highlight their potential as TB diagnostic biomarkers.

OA04-134-18 COVID-19 severity and risk of tuberculosis disease development within one year follow-up: A nationwide cohort study in Chile

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Background: Severe COVID-19 causes profound immune dysregulation and pulmonary sequelae, which may heighten the risk to progressing from tuberculosis infection (TBI) to active disease. The use of corticosteroids and other immunomodulators in its management may further contribute to this progression.
However, the extent to which these factors influence the subsequent risk of developing an active tuberculosis (TB) remains uncertain.
Design/Methods: We conducted a nationwide retrospective cohort study in Chile, including all adults (≥18 years) with a PCR-confirmed SARS-CoV-2 infection between March 1, 2020 and October 31, 2022. Data were linked across five national health registries. SARS-CoV-2 infection severity was categorized as asymptomatic, non-hospitalized symptomatic, hospitalized non-critical, and hospitalized critical.
Participants were followed for up to 12 months. The outcome was the incidence of a newly notified TB. Adjusted hazard ratios (aHRs) and 95% confidence intervals (CIs) were estimated using a parametric Weibull regression model, controlling for sociodemographic factors, SARS-CoV-2 vaccination status, and main comorbidities.
Results: Among 3,607,175 individuals with SARS-CoV-2 infection, 731 (0.03%) developed TB within a year. TB risk was significantly higher among all those hospitalized for COVID-19 —whether non-critical (aHR 8.19, 95% CI 6.17–10.88) or critical (aHR 7.75, 95% CI 5.41–11.09) — compared to individuals with asymptomatic SARS-CoV-2 infection. SARS-CoV-2 vaccination modified this association: unvaccinated individuals had an aHR of 13.40 (95% CI 9.77–18.38) versus 2.81 (95% CI 1.68–4.69) among those vaccinated. Tuberculosis risk nearly doubled

during the period when corticosteroid use for COVID-19 became widespread. Additional independent risk factors for TB included older age, male sex, migrant status, enrollment in the public healthcare system, and other chronic health conditions.

Table 2. Factors associated with active TB development in a SARS-CoV-2 infection cohort in Chile, 2020-2022. Comparative models: Selected model, stratum of vaccinated individuals, and stratum of unvaccinated individuals.

	Global model (n=3,667,175)				Vaccinated strata (n= 971,669)				Unvaccinated strata (n= 3,052,966)			
Characteristic	Adjusted Hazard Ratio (aHR)	95% CI Lower	Upper	p-value	Adjusted Hazard Ratio (aHR)	95% CI Lower	Upper	p-value	Adjusted Hazard Ratio (aHR)	95% CI Lower	Upper	p-value
Infection Status												
Asymptomatic	(ref)	-	-		(ref)	-	-		(ref)	-	-	
Symptomatic COVID-19 non hospitalized	0.90	0.73	1.10	0.324	0.97	0.71	1.31	0.851	0.91	0.69	1.21	0.551
COVID-19 hospitalized non-critical	8.19	6.39	10.53	**<0.001**	2.31	1.46	3.64	**<0.001**	14.02	10.27	19.12	**<0.001**
COVID-19 hospitalized critical	7.75	6.00	10.00	**<0.001**	2.81	1.68	4.69	**<0.001**	13.43	9.77	18.38	**<0.001**
Age group												
15-30 years	(ref)	-	-		(ref)	-	-		(ref)	-	-	
31-45 years	0.98	0.79	1.23	0.918	0.74	0.52	1.17	0.244	0.91	0.69	1.20	0.525
46-60 years	1.23	0.98	1.55	0.063	1.14	0.76	1.70	0.510	1.04	0.78	1.37	0.774
61-75 years	1.32	1.03	1.70	**0.026**	1.12	0.73	1.72	0.574	1.02	0.75	1.40	0.866
75+ years	1.04	0.76	1.43	0.785	1.09	0.68	1.65	0.997	0.72	0.48	1.07	0.113
Sex (Male)	2.01	1.67	2.42	**<0.001**	2.49	1.85	3.32	**<0.001**	1.76	1.44	2.13	**<0.001**
Migrant	3.57	2.90	4.40	**<0.001**	5.09	3.38	7.67	**<0.001**	3.01	3.02	4.79	**<0.001**
Health Care Insurance System (Public)	2.71	1.82	4.03	**<0.001**	3.32	2.14	5.12	**<0.001**	3.74	2.38	5.87	**<0.001**
Diabetes	1.72	1.34	2.21	**<0.001**	1.11	0.73	1.71	0.663	1.26	0.94	1.69	0.385
Chronic disease[a]	3.07	2.37	3.97	**<0.001**	2.13	1.40	3.24	**<0.001**	2.39	1.81	3.15	**<0.001**
Inpp	-0.44	-0.51	-0.37	**<0.001**	-0.18	-0.31	-0.06	**0.003**	-0.55	-0.64	-0.46	**<0.001**

Notes:CI: Confidence Interval [a] At least one (lung, kidney, asthma, liver disease). [b] At least one dose of CanSino vaccine or two doses of another type of vaccine prior to the identification of SARS-CoV-2.

Conclusions: Greater COVID-19 severity markedly increased the risk of developing TB during follow-up. These findings highlight the need for targeted TBI screening and preventive strategies among individuals recovering from severe COVID-19, particularly those with underlying comorbidities.

OA04-135-18 Biomarkers for diabetes mellitus (DM) and inflammation in people diagnosed with pulmonary tuberculosis (PTB)

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Background: Biomarkers to accurately diagnose DM in people with TB (PWTB) are needed. Glycated haemoglobin (HbA1c) appears to over diagnose DM at TB disease onset. Fructosamine which measures glycated serum proteins may be an alternative. We report HbA1c, high-sensitivity C-Reactive protein (hsCRP) and fructosamine before TB treatment and one month after treatment completion.
Design/Methods: We enrolled a cohort of eligible adults(25 -65 years) with microbiologically confirmed PTB who had taken ≤5 doses of TB treatment. We purposively recruited three groups of PWTB:those without evidence of DM; those self-reporting prior DM, and those presenting with HBA1c≥6.5% or fasting glucose≥7mmol/l (characterised as dysglycaemic). All had HIV status ascertained with CD4 count and HIV viral load(VL) if living with HIV(LWH). Sputum was subjected to Xpert Ultra and mycobacterial culture. Proportions for categorical measures and medians (interquartile ranges) of biomarkers were determined by group.
Results: Of 76 participants(all positive Xpert MTB/Rif Ultra and most (88%) culture positive),54 had no DM,11 self-reported DM, and 11 were identified with dysglycaemia. Their median age was 37(IQR:31-45) years; 65% were male. 51% were LWH, their median CD4 count was 201cells/mm^3, 72% were on anti-retroviral therapy and 49% had VL<50 copies/ml. Median values for HbA1c, hsCRP and fructosamine at initiation of, and after TB treatment in those without DM were, respectively: 5.9% vs 5.5%, 106mg/L vs. 5.8mg/L , 232µmol/L vs. 271.5µmol/L; in those with DM: 11.7% vs.10.6% ,47.5mg/L vs 1.8mg/L ,491µmol/L vs. 443µmol/L ;and in the dysglycaemic group: 6.6% vs. 5.2% ,241mg/L vs. 5.9mg/L and 246µmol/L vs. 243.5 µmol/L. With TB treatment, HbA1c normalises in the dysglycaemic group and hsCRP approaches normal in the TB+DM group. Fructosamine levels in the TB+DM group are two fold those in the other groups at both timepoints.
Conclusions: Fructosamine appeared to identify diabetes in people with TB. Dysglycaemia as identified by HbA1c was transitory and normalised post treatment.

OA04-136-18 The impact of HIV on the phenotype and function of Mycobacterium tuberculosis-infected human alveolar macrophages

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Background: People with HIV-1 (PWH) face a heightened risk of developing tuberculosis (TB) compared to HIV-1-uninfected individuals (HIV-). Pulmonary TB is the most prevalent form of TB in this population. Despite advancements like antiretroviral therapy (ART), which

has reduced HIV-associated pulmonary TB rates, PWH still faces a threefold greater risk of TB compared to HIV-infected individuals, indicating persistent deficiencies in *Mycobacterium tuberculosis* (*Mtb*)-specific immune responses in the lungs. We postulated that PWH have impaired early innate immune responses, making them more susceptible to TB disease.

Design/Methods: We conducted a study at the Malawi Liverpool Wellcome Research Programme (MLW) and the Queen Elizabeth Central Hospital in Blantyre, Malawi. Participants, including healthy HIV-uninfected individuals and asymptomatic PWH aged between 18 and 60 years, who underwent bronchoscopy to collect bronchoalveolar lavage (BAL) samples. We used a CDC1551 fluorescent reporter Mtb strain expressing mCherry for flow cytometry analysis to evaluate *Mtb* uptake by AMs. Surface immunophenotyping determined CD206 and HLA-DR expression, while intracellular cytokine staining assessed IL-6 and TNF-α production in *Mtb*-infected AMs.

Results: Among 34 participants (17 HIV-negative, 17 PWH, including 4 ART-naive) (28 females and 6 males), PWH had a median CD4 count of 511.0 cells/μl (range 113-841 cells/μl). PWH-derived AMs showed reduced CD206 expression (MFI 943) compared to HIV-negative individuals [(MFI 3878) (p=0.0001)] and diminished *Mtb*-specific IL-6 [(MFI 632.0 vs. 1664) (p=0.081)] and TNF-α [(MFI 3017 vs. 10386) p=0.0104)] responses. Despite ART, PWH AMs exhibited increased HLA-DR expression [(MFI 7049 vs. 3543) (p=0.0402)], indicating ongoing immune activation.

Conclusions: Our findings reveal HIV-associated downregulation of CD206 and increased HLA-DR expression on alveolar macrophages, indicating ongoing immune activation despite ART. Additionally, reduced IL-6 and TNF-α production suggests impaired early control of Mtb. This persistent dysregulation may underlie the elevated TB risk in PWH, even after effective ART.

OA04-137-18 Impact of glycemic control on multidrug-resistant tuberculosis treatment outcomes

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Background: Multidrug-resistant tuberculosis (MDR-TB) presents a major challenge to global TB prevention and care efforts. Comorbid Type 2 Diabetes Mellitus (DM) has been associated with higher rates of unfavorable MDR-TB treatment outcomes. While mechanisms remain unclear, evidence suggests sustained glycemic control may improve treatment outcomes.

We estimated the total effect of controlled and uncontrolled diabetes at baseline on unfavorable treatment outcomes, hypothesizing that uncontrolled hyperglycemia explains unfavorable treatment outcomes among those with diabetes.

Design/Methods: We fit a generalized linear model with a logit link using data from the endTB observational study. Eligible participants were adults with a baseline diabetes diagnosis. Diabetes was classified, at enrollment, as controlled (hemoglobin A1c (HbA1c) <7%) or uncontrolled (HbA1c ≥7%). Unfavorable treatment outcomes were defined as a composite of death, treatment failure, and loss to follow-up (LTFU). Secondary analysis disaggregated LTFU from death and failure.

Results: Among 1,644 participants, 215 (13.1%) had diabetes at baseline (72 controlled and 143 uncontrolled) (Table).

		Unfavorable Outcomes		Death Among Unfavorable Outcomes		Treatment Failure Among Unfavorable Outcomes		LTFU Among Unfavorable Outcomes	
Diabetes Status at Baseline	N	N	Proportion (%)	Died (N)	Proportion (%)	Treatment Failure (N)	Proportion (%)	LTFU (N)	Proportion (%)
No Diabetes	1429	294	20.6	127	43.2	62	21.1	105	35.7
Uncontrolled Diabetes	143	37	25.9	15	40.5	3	8.1	19	51.4
Controlled Diabetes	72	15	20.8	12	80.0	1	6.7	2	13.3

The adjusted odds ratio (OR) for uncontrolled diabetes, versus no diabetes, and unfavorable MDR-TB treatment outcome was 1.27 (95% CI: 1.04, 2.29), while the adjusted OR for controlled diabetes was 0.74 (95% CI: 0.44, 1.06). Uncontrolled diabetes was associated with an outcome of LTFU (OR: 1.93, 95% CI: 1.12, 3.19) compared to no

diabetes. The adjusted OR for uncontrolled diabetes and death and treatment failure was 1.09 (95% CI: 0.66, 1.24) compared to those with no diabetes.
Conclusions: In this multi-country cohort, baseline uncontrolled diabetes was not associated with increased risk of death or treatment failure but was positively associated with LTFU. These findings suggest that a complex interaction of social, behavioral, and treatment factors - potentially contributing to both poor glycemic control and LTFU - may be the primary drivers of poorer MDR-TB outcomes, rather than purely underlying biological mechanisms.

OA04-138-18 Demonstrating integrated mental health screening during treatment of people-centered drug-susceptible tuberculosis (DSTB) service in Myanmar

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Background and challenges to implementation: People with TB (PwTB) frequently face mental health challenges, including depression which can influence treatment outcomes. Integrating mental health support in TB care is critical for ensuring people-centered response. STOP TB Reach Wave 10 funded private provider interface agency for integrated service delivery project by PATH and Myanmar Health Assistant Association integrated Patient Health Questionnaire-9 (PHQ-9) depression assessment into drug-susceptible TB (DS-TB) service in two semi-urban townships in Myanmar, with assessments at treatment initiation andduring intensive phase.
Intervention or response: Health workers conducting PHQ-9 received structured 3-day training from mental health professionals and used validated Burmese-language PHQ-9 for people with limited literacy to ensure consistent understanding. Following TB education and counseling at treatment initiation, all PwTB starting treatment were screened for depressive symptoms using PHQ-9. A second assessment was conducted during the intensive treatment phase, after follow-up DS-TB adherence counseling. PwTB with mild symptoms (score <9) received regular counseling; PwTB with moderate or severe symptoms (score >9) were referred to a mental health specialist.
Results/Impact: Of 85 individuals (17-80 years), 85.9% had no depressive symptoms at baseline, improving to 88.2% at the second assessment. Mild symptoms declined from 14.1% to 11.8%. Notably, 10.6% improved from mild to no symptoms—75% of those initially with mild symptoms. Meanwhile, 8.2% shifted from no to mild symptoms, representing 9.6% of those with initially no symptoms. Most participants (81.1%) remained in the same category: 77.6% with no symptoms throughout, and 3.5% with persistent mild symptoms. No moderate or severe symptoms were reported at either time point.

	Initial Assessment % of Total (n=85)	Second Assessment % of Total (n=85)
No depressive symptoms (Score 0-4)	85.9% (n=73)	88.2% (n=75)
Mild symptoms (Score 5-9)	14.1% (n=12)	11.8% (n=10)
Transition	% of Total (n=85)	
Mild symptoms → no symptoms	10.6% (n=9)	
No symptoms → mild symptoms	8.2% (n=7)	
No symptoms → no symptoms	77.6% (n=66)	
Mild symptoms → mild symptoms	3.5% (n=3)	

Table 1: Changes in PHQ-9 status from initial to follow-up assessment.

Conclusions: Provision of integrated PHQ-9 screening in TB care is both feasible and valuable in supporting people-centered TB response. Counseling provided at key treatment stages may play a role in mitigating depressive symptoms during treatment. Scaling up mental health integration requires sustained investment in training, supervision, and linkage to further psychosocial services.

OA04-139-18 Disability is a risk factor for 1-year mortality after tuberculosis diagnosis in Korea

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Background: We previously identified that people with disabilities have a higher risk of developing active tuberculosis. Building on this finding, we aimed to assess the effect of disability on 1-year mortality among people with tuberculosis.
Design/Methods: We conducted a nationwide population-based cohort study using the linked national registry databases in the Republic of Korea. From the National Disability Registration Database, we collected information on disabilities. The extracted information on disabilities was linked to variables selected from the National Health Information Database using the personal identification numbers.
Next, we established a link between these datasets and information regarding the causes of death from the cause-of-death statistics obtained from Statistics Korea. The primary endpoint was to compare 1-year mortality after tuberculosis diagnosis between people with and without

disabilities. Cox proportional hazard models were used to evaluate the hazard of 1-year mortality and explore related factors.

Results: Of the 317,597 enrolled participants with newly diagnosed active tuberculosis between 2008 and 2016, 33,712 (10.6%) had disabilities. Individuals with disabilities were significantly older (64.4±15.2 vs. 50.3±20.0) and predominantly male (64.2% vs. 55.2%) at the time of TB diagnosis. Individuals with disabilities had a higher incidence of all-cause mortality than those without disability (7.77 vs. 2.85 per 100,000 person-months). Disability was significantly associated with 1-year mortality (adjusted hazard ratio [aHR], 1.24; 95% confidence interval [CI], 1.19–1.29).

All-cause mortality also increased with age (aHR per 10 years, 2.06; 95% CI, 2.02–2.09) and was higher in males (aHR, 1.391; 1.84–1.98). Lower income levels and higher Charlson Comorbidity Index were also associated with increased mortality.

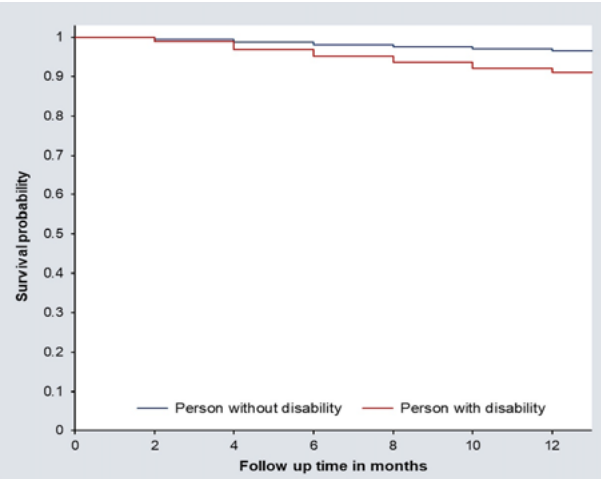

Figure. Survival rate Kaplan-Meier plots.

Conclusions: People with disabilities exhibit a higher 1-year mortality rate after tuberculosis diagnosis than those without disabilities. Tailored healthcare interventions and policies to improve anti-TB treatment outcomes for people with disabilities are necessary.

OA04-140-18 CD4 counts in HIV-negative participants in the RATIONS trial: The effects of gender and disease status

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Background: CD4+ T cells play an essential role in protection from TB.CD4+ lymphopenia has been reported in patients with TB even without HIV infection. We report on baseline CD4 counts and predictors of CD4 lymphopenia in a subset of PwTB and their household contacts (HHC) at baseline within the RATIONS trial.

Design/Methods: We enrolled 268 participants (96/2800 PwTB, 172/6073 HHCs) using a convenience sample and estimated CD4 counts on a Beckman Coulter flow cytometer using standard protocols. None of the HHC were HIV positive; there were 6 PwTB with known HIV infection (0.3%). Underweight was a body mass index (BMI) <18.5 kg/m^2. We defined 2 thresholds for CD4 counts – low (< 500 cells/ul) and very low (< 300 cells/ul).

Results: Both PwTB and HHCs had a high prevalence of underweight, 82% of PwTB and > 33% of HHCs. The median CD4 counts in HHCs were lower than those reported for a healthy Indian population. Women HHCs had a median CD4 count of nearly 150 cells/µl higher than men HHCs despite lower weight, BMI, and hemoglobin. One in 4 HIV-negative HHC had low CD4 counts, and this proportion was lower in women compared to men.

Characteristics	Patients with TB (n=96)			p-value	Adult household contacts (n=172)			p-value
	Overall	Men (n=64)	Women (n=32)		Overall	Men (n=51)	Women (n=121)	
Age, median (IQR)	34.5 (26, 45)	35 (26,45.5)	29.5 (24.5,44.5)	0.283*	34 (27, 48)	35 (28,51)	33.0 (27,45)	0.353*
Weight in kg, median (IQR)	40.9 (36.3, 45.8)	41.7 (39.2, 47.5)	36.6 (34.0,42.5)	0.002*	44.6 (39.0, 50.3)	51.5 (47.9, 57.5)	42.8 (37.9, 46.3)	<0.00005*
BMI in kg/m^2 median (IQR)	16.2 (14.9, 17.8)	16.3 (14.9, 17.7)	16.0 (15.0, 17.9)	0.935*	19.2 (17.4, 21.0)	20.2 (18.2, 22.3)	18.8 (17.1, 20.4)	0.0047*
% Low BMI, (95% CI)	82.3 (73.2, 88.8)	82.8 (71.3, 90.3)	81.3 (63.2, 91.6)	0.850§	38.8 (31.7, 46.4)	25.5 (15,2, 39.5)	44.5 (35.8, 53.6)	0.020§
Hb in g/dl, median (IQR)	10.6 (9.2, 11.9)	10.8 (9.2, 10.6)	10.4 (9.2, 11.2)	0.267*	11.7 (10.7, 13.1)	13.5 (12.6, 15.2)	11.3 (10.5, 12.0)	<0.00005*
CD4 cells/µl, median (IQR)	436 (292, 550)	406 (281, 536)	487 (320, 584)	0.095*	665 (501, 865)	583 (445, 722)	731 (551, 918)	0.0004*
% CD4 count <500/µl (95% CI)	66.7 (56.6, 75.5)	70.3 (57.8, 80.4)	59.4 (41.2, 75.3)	0.284§	24.4 (18.5, 31.4)	37.3 (24.9, 51.5%)	19.0 (12.9, 27.1)	0.011§
% CD4 count <300/µl (95% CI)	25 (17.3, 34.7)	28.1 (18.3, 40.6)	18.8 (8.4, 36.8)	0.317§	1.7 (0.56, 5.3)	1.96 (0.26, 13.20)	1.65 (0.41, 6.45)	0.888§

**Mann-Whitney U test; § Chi-squared test*

Over two-thirds of the PwTB at baseline had low CD4 counts, and a quarter of PwTB had very low CD4 counts. Overall, the predictors of low CD4 counts in the participants were age (aOR=1.03), male sex (aOR=1.99), and disease status (aOR=5.36), with a trend towards an association with low BMI in PwTB (aOR=2.72, p=0.088).
Conclusions: HHCs had lower CD4 counts than reference values for Indians, and a significant prevalence of low CD4 counts. Despite poorer nutritional parameters, women HHCs had significantly higher CD4 counts than men HHCs. Disease status was a predictor of low CD4 and very low counts despite HIV-negative status.

OA05 It takes a village: Improving prevention and detection of TB among children

OA05-141-18 Global, regional, and national burden of tuberculosis among children aged 0-14 years from 1990 to 2021: Results from the Global Burden of Disease Study 2021

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Background: Tuberculosis remains a significant global public health challenge, particularly among children.
Design/Methods: Data on tuberculosis (drug-susceptible, MDR-TB, and XDR-TB) incidence and disability-adjusted life years (DALYs) among children aged 0-14 years in 204 countries and territories from 1990 to 2021 were extracted from the GBD 2021. Estimated annual percentage changes (EAPC) in the age-standardised incidence rates (ASIR) and DALY rates of tuberculosis, by age, sex, and socio-demographic index (SDI), were calculated to quantify the temporal trends. Spearman correlation to evaluate associations between tuberculosis burden and SDI.
Results: In 2021, there were an estimated 759,300 new tuberculosis cases among children globally, with an ASIR of 37·7 per 100,000 population. The global ASIR and DALY rates showed a declining trend from 1990 to 2021, with annual reductions of -2·61% (95%CI: -2·74 to -2·47) and -4·38% (-4·61 to -4·14), respectively.
However, regional disparities were evident, with Southern Sub-Saharan Africa had the highest ASIR (164·3 per 100,000) and DALY rates (1051·2 per 100,000). From 1990 to 2021, only High-income North America (EAPC=1·12, 95% CI: 0·61 to 1·64) showed an increasing trend in ASIR of tuberculosis.
Eight of the 21 GBD regions showed an increasing trend in ASIR of MDR-TB, with the largest increasing trend in Oceania (11·99,10·49 to 13·52), followed by Central Asia (9·76, 6·48 to 13·13) and South Asia (5·71, 3·10 to 8·38). A strong negative correlation was observed between tuberculosis burden and SDI, with low-SDI regions showing the highest disease burden.
Conclusions: Despite global declines in tuberculosis incidence and DALYs among children, significant regional disparities persist, particularly in Sub-Saharan Africa and regions with rising MDR-TB incidence. Targeted interventions are crucial for reducing the burden of tuberculosis and are indispensable for achieving global tuberculosis elimination targets.

OA05-142-18 Accuracy of Xpert MTB/RIF Ultra vs. liquid culture in induced sputum samples from children in a multicentric Brazilian study

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Background: Culture remains the "gold standard" method for tuberculosis (TB) diagnosis, despite the long time for results. Diagnosis of TB in children is challenging because of nonspecific signs, paucibacillary disease, lack of expertise, and infrastructure for microbiological diagnosis. We evaluated the accuracy of Xpert MTB/RIF Ultra versus liquid culture in induced sputum.
Design/Methods: Cross-sectional study in 22 Brazilian sites. Children <15 years old were prospectively enrolled in two settings (hospitals and outpatient TB clinics) from December 2021 to March 2025.
All participants underwent induced sputum collection, and the same sample was analyzed by Xpert MTB/RIF Ultra and liquid culture (MGIT method).
Positivity of Xpert MTB/RIF Ultra was defined as detected (high, medium, low, very low, trace). Diagnostic accuracy was calculated using the epiR package.
Results: 2,262 participants were screened, and 1,792 included, with a median age of 3.2 (IQR 1.2-6.8). 1,472/1,792 (82.1%) had valid results, and 61/1,792 (3.4%) had culture contamination. 1,425/1,472 (96.8%) participants had negative TB results in both techniques, 23/1,472 (1.6%) were TB positive in MGIT and Xpert MTB/RIF Ultra (5 high, 4 medium, 8 low, 2 very low, and 4 trace detection), 16/1,472 (1.1%) had TB detection in Xpert MTB/RIF Ultra (4 very low and 12 trace) and were negative in MGIT, and 8/1,472 (0.5%) were positive in MGIT and negative in Xpert MTB/RIF Ultra.
Sensitivity was 74.2% (95% CI 55.4-88.1), and specificity was 98.9% (95% CI 98.3-99.4).
Conclusions: These partial results suggest that Xpert MTB/RIF Ultra using induced sputum samples may be a useful and faster alternative to MGIT in the diagnosis of TB in children.

OA05-143-18 Impact of the simple one step stool sample processing technique: The wellness on wheels truck experience in Ganjuwa Nutrition clinic, Bauchi state Nigeria

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Background and challenges to implementation: In Nigeria, there are limited personnel trained in collecting appropriate respiratory specimens from those who cannot produce sputum especially children. Also, the number of facilities with TB molecular diagnostic machines is limited. KNCV Nigeria, in collaboration with the National Tuberculosis Control Program, implemented a modified simple-one-step (SOS), stool-based Xpert MTB/RIF method for diagnosis of TB in children who cannot expectorate sputum. We evaluated the impact of the mobile truck (Wellness on Wheels*)* mounted with Genexpert for childhood TB diagnosis.
Intervention or response: The wellness on wheels Mobile truck equipped with a digital x-ray coupled to an Artificial Intelligence software and Genexpert machine was deployed to MSF-supported Nutrition clinic at Ganjuwa, Ganjuwa LGA Bauchi state, Nigeria during the National Childhood TB testing week. Stool samples were collected from children presumed to have TB and analyzed using the Simple one-step stool processing method (SOS) and Xpert MTB/RIF Ultra testing.
The national childhood testing week is a weeklong activity dedicated to finding the missing TB cases particularly in children in the country. We analyzed data from this activity for the year 2024.
Results/Impact: During the week a total of 319 children were screened with 110 presumptive TB cases identified, a total of 110 stool samples were collected and processed using the Simple one-step method in May 2024 at Nutrition clinic Ganjuwa, Bauchi state with 3 (3%) Mycobacterium Tuberculosis (MTB) detected. All 3 diagnosed cases were DSTB and were enrolled on treatment.
Conclusions: The simple one step stool processing technique is an efficient and simple method that can improve yield from the Xpert based stool testing, we recommend continuous training and retraining of personnel for improved adherence to the SOP to ensure improved performance and better yield.

OA05-144-18 End-user perspectives on pediatric TB diagnostic processes in Uganda and Peru: A qualitative study

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Background: New, child-friendly sample types offer promise for decentralized and reliable pediatric TB diagnosis. However, little is known about their acceptability, feasibility, and equity implications.
This study explores the perspectives of healthcare workers, decision-makers, and caregivers regarding the sample collection processes for novel pediatric TB diagnostics in Uganda and Peru, aiming to identify barriers and facilitators to support their implementation and use at the point of care.
Design/Methods: Using qualitative methods, we conducted 51 in-depth interviews and 4 focus group discussions with caregivers of both children with TB, living with or without HIV/AIDS, healthcare workers, and decision-makers in Uganda and Peru, between May 2024 and March 2025. Thematic content analysis was used to analyze the data and identify key themes.
This study was nested within NOD-pedFEND, a diagnostic accuracy study.
Results: Participants emphasized the importance of clinical encounters, where healthcare workers ease caregivers' procedural fear through counselling. Familiarity with sample collection processes further enhanced acceptability. Although more invasive procedures like gastric aspirate and nasopharyngeal aspirate caused a higher emotional burden for both caregivers and providers compared to upper airway swabs and stool collection, they reported trusting the results more.
Invasive samples were perceived as more reliable, being collected from deeper within the body or areas where TB bacilli accumulate. Both caregivers and healthcare workers preferred same-day sample collection to avoid the challenges of home collection and the need for multiple hospital visits. Contextual and societal factors, including financial burdens, limited infrastructure, stigma, and low awareness, were identified as barriers to feasibility at primary healthcare level.
Conclusions: Findings were consistent across participant groups and countries. This study may help inform the implementation of new diagnostics by exploring acceptability, feasibility, and equity from an end-user perspective, while also pointing to the need for further research on pediatric TB barriers and facilitators in community-level settings.

OA05-145-18 Scaling impact: Enhancing childhood TB detection through monthly testing initiatives in Cross River State

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Background and challenges to implementation: The National Tuberculosis and Leprosy Control Program instituted the National Childhood TB Testing Week to boost childhood TB case finding, which has proven to be an effective strategy for finding childhood TB cases in Nigeria.
However, outside of the testing week which happens every May, TB LON Cross River State has struggled and underperformed on this indicator only achieving 45% of their 2023 annual target.
Intervention or response: Given the success of Childhood TB Testing Week, the TB LON Cross-River team instituted a monthly Childhood TB testing exercise. Every third week of the month, community outreaches focus on screening children using strategies from Childhood TB Testing Week, such as increased awareness and social mobilization, targeted screening and testing in high-risk settings, and the use of innovative diagnostic tools, including stool testing. This was piloted in 6 Local Government Areas from July 2024 to November 2024.
Results/Impact: Post institution of the monthly testing exercises, 50 childhood TB cases were detected, from July to November 2024, representing 45.5% of all childhood TB cases recorded from January to November 2024. This reflects a marked improvement compared to the 38.2% recorded in the pre-intervention months (January–June 2024), which also included the National Childhood Testing Week.
Notably, 32% of all presumptive samples during this period were stool samples, and 44% of diagnosed cases were through stool testing — a significant rise from earlier months where stool testing was underutilized.

Figure.

Conclusions: Regular community outreach, modelled on successful strategies, can significantly improve childhood TB case detection, especially through innovative diagnostic approaches like stool testing.

OA05-146-18 Comparison of the National TB and Leprosy Program and World Health Organization criteria for pulmonary tuberculosis severity classification among children in Uganda

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Background: Implementation of the WHO severity criteria to shorten TB treatment for children has been challenging due to their dependence on chest X-ray (CXR). The Uganda National TB and Leprosy Program (NTLP) released broader criteria that may be able to compensate in settings with limited access to CXR.

Design/Methods: We analyzed data from children less than 15 years diagnosed with confirmed or clinical TB using NTLP guidelines from 2018-2023 in Kampala, Uganda. We applied three TB severity criteria:

1. WHO with CXR (CXR features of severe TB, hospitalized, severe acute malnutrition, or confirmed TB with high bacillary load [*i.e.,* smear-positive or Xpert-positive with medium, high or very high semi-quantitative grade and if less than 3 months old];
2. WHO without CXR, and;
3. NTLP (WHO without CXR criteria plus all children with HIV or confirmed TB).

We compared the accuracy of the NTLP and WHO without CXR criteria to the WHO with CXR criteria as a reference standard.

Results: Among 693 children included, median age was 2.6 years (IQR 1.2-5.1), 118 (17%) had confirmed TB, and 66 children (9.5%) were living with HIV. Using the WHO criteria with CXR, 29% (201) had severe TB (of whom 16.4% were living with HIV and 10.4% were paucibacillary).

Compared to the WHO with CXR criteria, the WHO criteria without CXR and NTLP criteria were 61% and 69.7% sensitive, respectively, and 98% and 81% specific, respectively (*Table 1.*)

	Sensitivity % (95% CI)[1]	Specificity % (95% CI)[1]	NPV % (95% CI)[1]	PPV % (95% CI)[1]
NTLP without CXR	69.7 (63 – 76)	81 (77- 84)	86.7 (77- 89.7)	60.1 (53.5 - 66.4)
WHO Criteria without CXR	61 (54-68)	98.4 (96 -99)	86.1 (83- 88.9)	94 (88.3- 97.2)

Acronyms and legend
CI: Confidence Interval; CXR: Chest X-ray; NPV: Negative Predictive Value; PPV: Positive Predictive Value; NTLP: National TB and Leprosy Program, Uganda.
1. In reference to the WHO criteria with chest X-ray.

Table 1: Accuracy of the NTLP criteria for severity classification in comparison to WHO criteria without CXR.

Conclusions: The NTLP criteria increased detection of children with severe TB that would have been missed by the WHO criteria without CXR, but at the cost of overtreating children with non-severe disease. Adjuvant tools are needed to guide TB severity for children in settings with limited access to chest X-rays.

OA05-147-18 Accelerating childhood TB case detection in Bangladesh: BRAC experience from effective implementation strategies

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Background and challenges to implementation: Childhood Tuberculosis poses a substantial public health threat in a resource limited country like Bangladesh. The key challenges in child TB diagnosis include sub-optimal linkage to graduate practitioners and availability of pediatricians at peripheral facilities, lack of awareness, financial constraints faced by families. By March 2023, child TB cases detected in BRAC supported areas, represented only 3.4% of total detected TB patients, compared to the estimated incidence of 9% (Global Report 2024). Under the stewardship of National Tuberculosis Programme, BRAC executed some key strategies to mitigate the evolving gaps in child TB detection in the implementation areas.
Intervention or response: BRAC with the support of The Global Fund conducted orientations and workshops to strengthen linkage with graduate doctors, especially pediatricians emphasizing early detection, with a focus on clinical TB diagnosis among symptomatic children. Awareness campaigns were launched and we trained field staff and community health workers to help understanding the unique presentation of pediatric TB and refer to doctors for further evaluation. We enhanced providing social support (transport, diagnostic support for non-sputum sample & relevant tests) to symptomatic children of under-served families (low informal settlements, migrants, day laborers etc.) by third quarter 2023, for prompt diagnosis increasing linkage with pediatricians.
Results/Impact: Quarterly child TB case detection increased, from 1708 to 3049 and the proportion of child TB patients detected increased from 3.4% in Jan-Mar 2023 to 5.6% in Oct-Dec 2024. However, in 2024, 1921 child TB cases (presumptive positivity 19%) were detected from a total number of 10,152 child TB presumptive who were provided social support.

Year	Quarter	Total TB cases (New and Relapse)	Total no. of presumptive child TB	Total child TB cases detected	Proportion of child TB (%) among total TB cases
2023	Jan- Mar	50958	689768	1708	3.4
	Apr- Jun	51009	625234	1850	3.6
	Jul- Sep	52921	689640	2182	4.1
	Oct- Dec	52882	679109	2260	4.3
2024	Jan- Mar	53348	29889	2628	4.8
	Apr- Jun	55405	27975	2875	5.5
	Jul- Sep	56640	29917	2824	5.5
	Oct- Dec	60288	33502	3049	5.6

Table.

Conclusions: Programmatic strategies addressing the key challenges of identifying TB in children paved the way to continuous enhanced case detection in a high-burden country like Bangladesh to accelerate end- TB goals.

OA05-148-18 Safety, completion rate and rifapentine plasma concentration in Chinese children with 1HP for tuberculosis infection

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Background: To assess the feasibility and safety of 1HP regimen in young Chinese children with tuberculosis infection, and to provide pediatric-specific evidence for extrapolating dosing strategies to children.
Design/Methods: An open-label, prospective, single-arm clinical trial was conducted among eligible participants (aged ≤ 14 years old). Completion rate, safety and Rifapentine concentrations of 1HP regimen were analyzed.
Results: 98.75% (79/80) of participants completed the treatment, with only one case (1.25%) in 6-14 year group of non-completion because of rash. The median duration of treatment was 28 days. 6.25% (5/80) experienced grade ≥3 adverse events (AEs), with no serious adverse events (SAEs) or deaths reported. The relationship between rifapentine concentration (mg/L) and time (days) in children stratified by age and weight demonstrated lowest rifapentine concentration in participants less than 2 years old and less than 15kg when compared to the other subgroups.

Table1. Basic characteristics of the participants.

Characteristic	Median[min，max] / (%)
Age (month)	43.0[6.0, 168.0]
Age (year)	3.6[0.5, 14.0]
Gender(male)	48(60.0%)
Weight(kg)	15.0[8.0, 73.0]
Height(cm)	102.0[68.0, 173.0]
BMI (kg/m^2)	15.0[10.4, 24.7]
BCG scars	80 (100)

Table 2. 1HP regimen completion status by sex and age group

	≤2years (n=20)		2-5years (n=40)		6-14years (n=20)		Total (n=80)
	Male (n=10)	Female (n=10)	Male (n=23)	Female (n=17)	Male (n=15)	Female (n=5)	
Treatment completed	10(100%)	10(100.0%)	23(100%)	17(100%)	15(100%)	4(80.0%)	79(98.75%)
Treatment not completed	0	0	0	0	0	1(20.0%)	1(1.25%)

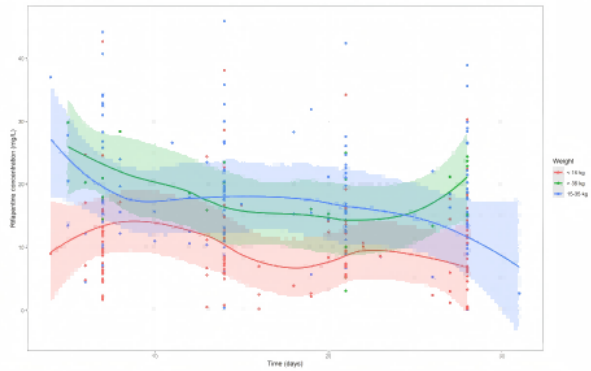

Figure 1. Rifapentine plasma concentration-time profiles across three weight-based pediatric subgroups.
The figure illustrates the relationship between rifapentine concentration (mg/L) and time (days) in children stratified by body weight: <15 kg, 15–35 kg, and >35 kg. Data points represent plasma rifapentine concentrations measured at serial time points post-administration. Pharmacokinetic parameters were calculated using non-compartmental analysis (NCA). Dashed lines indicate the median rifapentine concentration. Shaded areas represent 95% confidence intervals.

Conclusions: 1HP regimen is safe and feasible for young Chinese children with tuberculosis infection. Weight-based daily rifapentine (10-15 mg/Kg) might not be enough for young children, particularly for those younger than 2 years old and less than 15kg.

SHORT ORAL ABSTRACT SESSION (SOA)

SOA01 Maternal, child, and adolescent TB care: Prevention, diagnosis and treatment

SOA01-500-18 Integrating traditional birth attendants into TB disease finding: A culturally sensitive approach

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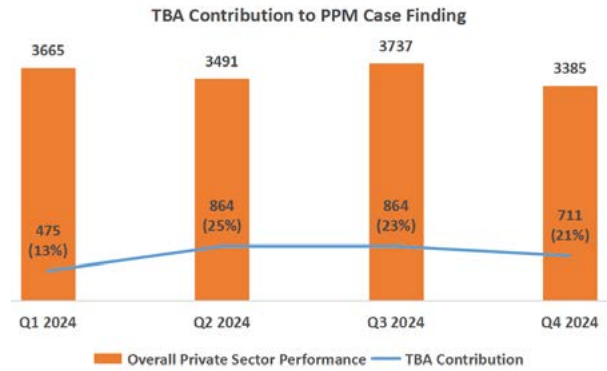
Background and challenges to implementation: Traditional Birth Attendants (TBAs) serve as trusted healthcare providers in many communities, particularly in rural and underserved areas. Their strong rapport with women and families presents a unique opportunity to enhance tuberculosis (TB) case finding. In Kaduna State, KNCV Nigeria under the Global Fund Community - Public Private Mix (CPPM) Grant engaged and integrated TBAs into private-sector TB case detection intervention known as the Public Private Mix (PPM) to improve early diagnosis and treatment initiation. The PPM intervention leverages private healthcare providers reach and resources to enhance TB notification rates and improve access to quality care.
Intervention or response: A structured engagement model implemented from January to December 2024 involved training TBAs to recognize TB symptoms, educating them on counselling and stigma reducing strategies and sample collection to ensure linkage of presumed TB patients for diagnostic testing. The intervention leveraged on TBAs' cultural and social influence to address barriers such as stigma, misinformation, and poor TB service accessibility.
Results/Impact: The number of TB patients diagnosed via TBAs rose markedly in Q2 2024, totaling 864 TB patients (25% of private sector TB cases) compared to 475 TB patients diagnosed (13%) in Q1 2024. Contributions, however, experienced a small drop to 23% though the absolute number stayed same in Q3 2024, and 711 TB patients diagnosed (21%) in Q4 2024. Despite the fluctuation, TBAs regularly accounted for over 20% of TB cases identified in the private sector, underscoring their crucial role in case detection.



Conclusions: Integrating TBAs into TB case finding offers a culturally sensitive and community-driven approach to improving early diagnosis. Sustaining and scaling this approach requires continuous training, incentives, and collaboration with formal healthcare structures.
Strengthening referral linkages and monitoring TBAs' engagement has also been shown to further optimize their role in TB control efforts, ultimately reducing the disease burden in high-risk communities.

SOA01-501-18 Leveraging traditional birth attendants to integrate TB/HIV screening into maternal care in unconventional settings: Experience from Katsina State, Nigeria

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Background and challenges to implementation: Despite efforts to combat tuberculosis (TB), HIV, and syphilis, challenges persist in reaching Pregnant Women (PW) in unconventional settings. In parts of Nigeria, the proportion of PW not attending antenatal care (ANC) is alarmingly high, 45% in Katsina, 35% in Kano and up to 85% in Kebbi.
To bridge this gap, the Institute of Human Virology Nigeria engaged Traditional Birth Attendants (TBAs), Mentor Mothers (MMs), and Community TB/HIV Workers (CTHWs) to screen all PW in these settings for TB, HIV, and syphilis and link them to health facilities offering ANC services.

This study evaluates the role of TBAs in optimizing screening of PW under the Global Fund Community Public-Private Mix (CPPM) project in Katsina State.

Intervention or response: A cross-sectional study was conducted from June 2024 to March 2025 to assess TB, HIV, and syphilis screening among PW not attending ANC in unconventional settings. All eligible PW encountered during Home-to-Home (H2H) active TB case search and those accessing care at Traditional Birth Homes (TBHs) were symptomatically screened for TB and tested for HIV and syphilis using dual rapid test kit. Data was collected from routine registers and analyzed. Positive results were reported as the screening outcome of each disease entity.

Results/Impact: From June 2024 to March 2025, a total of 26,138 pregnant women were screened during H2H and 8,320 at TBH. Among those tested, 15 women (0.057%) in H2H and 7(0.084%) in TBH were HIV-positive. Syphilis positivity was recorded in 11(0.042%) H2H and 3(0.036%) in TBH. For TB screening, 35(0.134%) women tested positive in H2H, while 8(0.096%) at TBH.

Conclusions: The engagement of TBAs in integrated TB/HIV/syphilis screening effectively expanded access to underserved PW in non-facility settings. This approach facilitated early detection, timely linkage to care, and highlighted TBAs' potential in community-based surveillance offering a scalable model for closing service delivery gaps in high-burden areas.

SOA01-502-18 Facility based screening for tuberculosis in pregnant and post-partum women in Papua New Guinea

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Background: Papua New Guinea has both a high incidence of tuberculosis (TB) (432/100000) and a high fertility rate (4.2 children/woman). Women have an increased risk of TB during pregnancy and postpartum. The Port Moresby General Hospital (PMGH) is the only public labor & delivery center in the National Capital District, where the incidence of TB is estimated at 1,117/100,000 and oversees 15,000 deliveries yearly.

Design/Methods: From June 2023 to March 2024, active TB screening of women in the peri-partum period presenting for care at PMGH was implemented. Screening officers verbally screen women for symptoms of TB at strategic entry points including: antenatal clinic, labor and delivery ward, children's immunization clinic, and postpartum ward. Women with a positive symptom screen complete chest radiography and GeneXpert testing in the antenatal clinic. If diagnosed with TB, the women were linked to care, their baby initiated on TB preventive treatment, and the team conducted household contact investigation.

Results: During the initial nine months of project implementation, 9969 women completed screening in the antenatal clinic (4956/9969, 49.7%), labor and delivery ward (674/9969, 6.7%), and postpartum clinic (4339/9969, 43.5%). It is estimated that 37% of ante-natally booked women were screened. Among screened women, 471/9969 (47.2%) report symptoms consistent with TB, and 19.6% report having had contact with a person treated for TB in the past year, and 3% were living with HIV. The TB prevalence was estimated to be 1.8% (184/9969) and primarily consisted of pulmonary (52.7%; 97/184) and drug-susceptible TB (97.8%; 180/184); 90.4% of women initiated TB treatment.

Conclusions: Systematic screening (including radiology and GeneXpert testing) of women attending antenatal clinics, delivery wards, or postpartum clinics effectively improves TB case detection. Integration of routine TB screening with peri-partum care supports timely linkage to TB care and treatment, thereby reducing risk of poor outcomes for mothers and their families.

SOA01-503-18 Leveraging AI-powered predictive mapping to improve TB/HIV case identification among pregnant women in Nigeria

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Background and challenges to implementation: Nigeria bears a dual burden of TB and HIV, accounting for 14% of global pediatric HIV infections (~21,000 cases) in 20220, with only 44% ART coverage for PMTCT. In 2022, an estimated 479,000 TB cases occurred, however, 285,000 were notified underscoring major detection gaps, particularly among women and children.
This study evaluates the effectiveness of an AI-powered predictive mapping tool in improving TB/HIV case identification among Pregnant Women (PW).
Intervention or response: With support from the Global Fund, the Institute of Human Virology Nigeria (IHVN) deployed an AI-driven hotspot mapping tool to predict underserved communities with high concentrations of PW unlikely to access ANC or HIV testing. Integrated TB/HIV screening was incorporated into ongoing community-based TB case-finding in 7 states between Oct–Dec 2024.
The AI-tool guided community health workers to 28 priority Local Government Areas (LGA), using Google Maps for navigation and a digital-platform for reporting. Simple frequencies were calculated using MS Excel.
Results/Impact: During the AI-guided intervention (Oct–Dec 2024), 6,984 PW were identified across 28 LGAs. Of the 5,419 eligible, 99.2% were tested for HIV, yielding a positivity rate of 0.6%. This represents a 1.5-fold increase and 50% relative improvement in HIV case detection compared to the 0.4% yield during the pre-intervention phase (July–Sept 2024), which reached 33,120 women across 158 LGAs.
For TB, 1,216 presumptive-cases were identified and 909 evaluated, with 68 cases diagnosed (7.4% yield). This exceeded the pre-intervention yield of 6.9% (73 cases from 1,057 evaluated), reflecting a 1.09-fold increase and 8.7% relative improvement.
Conclusions: AI-powered predictive mapping improved TB and HIV case detection among PW despite covering 82% fewer LGAs. This targeted, data-driven approach offers a scalable solution for enhancing early diagnosis, optimizing resource use, and strengthening PMTCT and TB/HIV integration in high-burden, underserved settings. Future efforts should scale digital tools for broader public health impact.

SOA01-504-18 Preferences identified by key stakeholders for novel TB treatment regimens for pregnant and breastfeeding women in two high TB burden settings

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Background: Pregnant women with TB have poor pregnancy and TB treatment outcomes, yet they are usually excluded from trials of novel therapeutic regimens, thereby limiting their TB treatment options. The Radiant-Moms study uses a discrete choice experiment (DCE) to examine preferences regarding novel shorter TB treatment regimens during pregnancy and postpartum among key stakeholders.
Design/Methods: As part of the DCE developmental phase, we identified an initial list of nine treatment and healthcare delivery attributes relating to TB treatment during pregnancy and postpartum: cost, wait time, treatment duration, side effects, safety, visit frequency, number of pills, taste, and risk for the baby. We conducted semi-structured in-depth interviews across two countries (South Africa and the Philippines) with 31 stakeholders (16 community influencers [CIs], 15 healthcare providers [HCPs]), to refine these attributes and understand how they may influence TB treatment decision-making and service delivery.
Results: There was agreement among CIs and HCPs on the importance of side effects, wait time, and visit frequency when designing TB treatment programs for pregnant and breastfeeding women. The additional attributes of risk for the baby, and treatment duration were high-

lighted by CIs and HCPs respectively. We added these attributes to our working list and refined language of the preliminary levels for each attribute. When asked to design the ideal TB treatment for women during pregnancy and postpartum, most participants suggested a shorter treatment (2-4 months) with fewer clinic visits. CIs in South Africa prioritized shorter waiting times, while those in the Philippines prioritized safety. We are now concluding similar qualitative work with pregnant and breastfeeding women.

Conclusions: Multiple TB treatment attributes were confirmed as likely important to pregnant and breastfeeding women's TB care preferences. There was some variability in stakeholders' anticipation of the likely most important attributes by country, though all attributes were coherent in both settings.

SOA01-505-18 Clinical mentoring to support the use of treatment decision algorithms for child TB diagnosis within a programmatic pilot in Mozambique and Zambia

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Background: Clinical mentoring can support introduction of clinically complex practices. We sought to implement and report on clinical mentoring for treatment decision algorithm (TDA) implementation for childhood TB at District Hospital (DH) and Primary Health Centre (PHC) level.

Design/Methods: The National TB programmes (NTPs) in Mozambique and Zambia are piloting the implementation of a comprehensive approach for improving childhood TB diagnosis and severity assessment for short course regimen within the Decide-TB project.

Following the training of healthcare providers (HCPs), onsite clinical mentoring visits were planned monthly for the first 3 months, supported by NTP facility mentoring guide. The performance of HCPs was assessed during bedside observations of TB screening, clinical examination, use of TDA, and disease severity assessment. Clinical case reviews were discussed in group meetings.

Results: As of March 2025, the first onsite clinical mentoring visit was conducted 6 to 8 weeks after the training in 28 facilities. A total of 62 HCPs (mean: 2.9 mentee per facility) were mentored. During bedside observations, most frequent areas identified for improvement included lack of systematic physical exam and recording of vital signs (26/28 facilities); and nutritional assessment (14/28 facilities). TB screening at entry points was not systematically done in 9/28 facilities, and 8/28 facilities were not assessing correctly for the TB screening questions.

Based on clinical case reviews, of 31 children assessed using the TDA, five were wrongly identified as presumptive TB and one was assessed with the wrong TDA. Immediate corrective actions focused on one-on-one bedside-teaching and orientation on TDAs in group meetings.

From 01/09/2024 to 03/03/2025	Mozambique District 1		Mozambique District 2		Zambia District 1		Zambia district 2	
Timing of visits since start of intervention (weeks)	W8-W13-W19		W6		W8-W13-W21		W6	
Health facility level and TDAs used	PHC (TDA B)	DH (TDA B&A)	PHC (TDA B)	DH (TDA B)	PHC (TDA B)	DH (TDA A)	PHC (TDA B)	DH (TDA B&A)
Number of facilities	5	2	5	1	6	1	6	2
Number of mentees: number, (mean for PHCs)	25 (5)	7	7 (1.4)	4	16 (2.6)	5	20 (3.3)	10
Number of cases discussed	28	3	0	0	6	2	2	4
Shortcomings in systematic screening (number of facilities)	0	1	3/5	1/1	1/6 (3 not reported)	not reported	2/6 (1 not reported)	1/2 (1 not reported)
Shortcomings in screening skills (number of facilities)	0	1	2/5 (2 not reported)	0/1	0/6 (5 not reported)	not reported	3/6 (1 not reported)	2/2
Physical exam & vital signs not assessed (number of facilities)	5/5 (vitals)	2/2 (vitals)	5/5	1/1 at OPD	6/6	1/1 OPD, and vitals for IPD	5/6	1/2 at OPD (1 not reported)
Nutritional assessment not systematically performed (number of facilities)	Not reported	Not reported	1/5	1/1 at OPD	4/6 (2 not reported)	1/1 at IPD	6/6	1/2 at OPD (1 not reported)

Conclusions: Clinical mentoring onsite visits following training are important to assess practices and propose corrective actions to reinforce capacities of HCPs to use TDAs at low level of health care. Vital signs and nutritional status assessment which are crucial for identifying TB presumptive children needed most of the support.

SOA01-506-18 Clinical predictors for radiological severe pulmonary tuberculosis in children: An individual participant data-analysis

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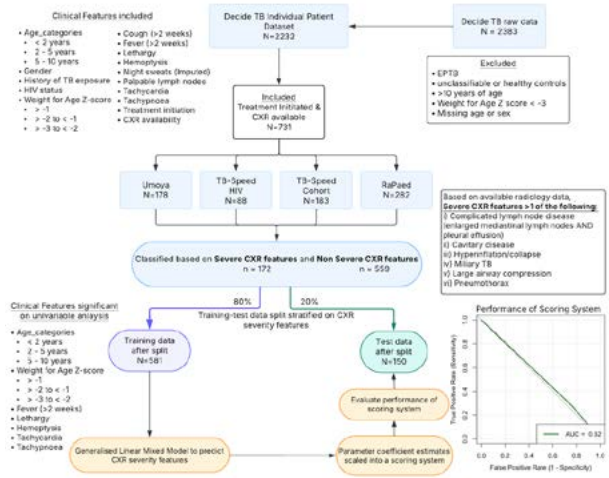
Background: The World Health Organization has endorsed shorter treatment regimens for children with non-severe tuberculosis (TB), defined by radiological criteria, yet chest X-ray (CXR) is unavailable in many settings. We aimed to identify clinical features predictive of radiological severity of TB.
Design/Methods: We developed a large individual patient dataset (Decide-TB) from children recruited to RaPaed-TB, Umoya, and TB-Speed. Children eligible for treatment shortening and initiated on TB treatment with an expert-reviewed CXR were included. A logistic mixed-effects regression model was developed to predict CXR severity and diagnostic accuracy was evaluated on the 80-20 train/test stratified data split. Logistic regression coefficients were converted into clinically interpretable scores.
Results: 731 children were started on TB treatment and had available CXR data. The median age was 2.9 years (interquartile range: 1.3-5.6), 384 (53%) were male, and 172 (24%) children were classified with severe CXR features. Clinical features significant on univariable analysis ($p<0.157$ or <0.135 for variables with 1 or ≥2 degrees of freedom) included in the model were age, weight-for-age Z-scores, fever for >2 weeks, lethargy, haemoptysis, tachycardia, and tachypnoea.
On multivariable regression, children presenting with weight-for-age z-scores between -2 and -1 (adjusted odds ratio, aOR 1.6 95%CI 1.02-2.59), fever (aOR 0.6 95%CI 0.38-0.97), lethargy (aOR 1.6 95%CI 1.03-2.54), haemoptysis (aOR 3.0 95%CI 1.02-8.85) or tachypnoea (aOR 1.8 95%CI 1.04-3.25) were more likely to have severe features on CXR. We scaled the coefficient estimates for the parameters in the model, such that a score >10 constituted a sensitivity of ≥80% & specificity of ≥54% on the training dataset. This scoring system was evaluated on the test dataset for identifying non-severe CXR features and had a sensitivity of 72.3% (95%CI: 0.63-0.80), a specificity of 24.7% (95%CI: 0.11-0.40) (Figure1).



Conclusions: Clinical predictors alone at baseline had sub-optimal performance in determining radiological disease severity.

SOA01-507-18 Closing the gap in paediatric TB detection: Innovative approaches to improve case finding among children in Nigeria

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Background and challenges to implementation: According to the WHO 2024 Global TB reports, an estimated 1.3 million children worldwide developed tuberculosis (TB) and 161,000 children died of TB, making it a major cause of childhood mortality yet childhood TB remains underdiagnosed due to non-specific symptoms and challenges in sample collection. In Nigeria, 32,490 children were estimated to have TB, but access to paediatric TB screening and diagnostics remains limited, particularly in underserved communities. Innovative approaches are required to enhance childhood TB case detection, improve diagnosis, and achieve national notification targets.

Intervention or response: The Global Fund GC7 TB/HIV Integrated Project implements a multi-pronged strategy to improve childhood TB detection across six Nigerian states in 2024. Screening was enhanced at outpatient departments (OPDs), nutrition clinics, immunization sites, traditional birth attendants (TBAs), private medicine vendors (PMVs), and community pharmacies. Community-based TB outreaches targeted schools, orphanages, and slums. To improve diagnostics, the project scaled up stool-based GeneXpert testing and Chest X-rays, while Paediatric Digital X-ray (PDX) machines were introduced for better screening accuracy. The Mobile Application for Tuberculosis Screening (MATS) was deployed in private facilities to optimize detection.
Results/Impact: In 2024, 407,884 children were screened, with 53,062 identified as presumptive cases and 2,674 confirmed TB cases. Private facilities contributed 1,199 cases (45%), while community-based screening identified 1,475 cases (55%). Rivers and Nasarawa states recorded the highest confirmed cases. Childhood TB cases accounted for 6% of all TB cases diagnosed across GC7 implementation states.
Conclusions: The integration of innovative diagnostics, targeted outreach, and digital tools has improved paediatric TB detection under GC7. Progress has been made; however, achievements still fall short of the 10% national target. Expanding access to stool-based GeneXpert, strengthening community-based active case-finding, and improving sample transport networks will be critical in closing the detection gap and achieving national childhood TB notification targets.

SOA01-508-18 TB screening in the traditional initiation schools in the Leribe district of Lesotho

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Background and challenges to implementation: TB has been linked to traditional initiation schools in Lesotho; the country has a high TB incidence, and the National TB Program has set out to improve case finding and treatment, especially in congregate settings such as these schools, through community-based interventions and collaboration with the traditional initiation schools' owners.
We evaluated the impact of TB screening in 10 traditional initiation schools in Leribe district of Lesotho.
Intervention or response: Out of the 32 owners of traditional initiation schools in the Leribe district, we approached 10 of them to do TB screenings on all students enrolled in their institutions. For young Basotho men in Lesotho, traditional initiation schools, or „lebollo," are a significant cultural rite of passage. They prepare them for maturity by teaching them about their culture and responsibilities. Seasoned old men known as "basuwe run these isolated courses, which typically take place in mountains or "the bush,"" and they can range from a few weeks to six months.
A negative sequential TB screening approach was employed, and TB nurses and TB screeners used W4SS and CXR to perform the screening at entry, two months later, and at exit.
Results/Impact: Out of the 32 available traditional initiation schools in the district, 886 students were screened from 10 traditional initiation schools. Of the 886 individuals screened, 220 (25%) had presumed TB, and sputum samples were collected from all of them for laboratory investigation.
Of the 220 people investigated, 12 (5.5%) people were diagnosed with TB: 6 (50%) bacteriologically with Xpert MTB/RIF Ultra and 6 (50%) clinically.
Conclusions: Addressing the tuberculosis threat in congregate settings, particularly within traditional initiation schools, necessitates a multifaceted approach that respects cultural beliefs while prioritizing health. The inherent challenges posed by poor ventilation in these environments exacerbate the risk of TB transmission, highlighting the urgent need for targeted interventions.

SOA01-509-18 Community generated content to mitigate stigma: Telangana's youth led solution

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Background and challenges to implementation: India's greatest strength is its demographic dividend, with 27% of its population aged 15-29. This young population is key to innovation, entrepreneurship, and digital transformation. The stigma surrounding tuberculosis (TB) remains a major barrier in the fight against the disease—leading to delayed diagnosis, treatment dropouts, and poor patient care, which in turn fuels transmission and mortality. But can the youth offer a solution to this challenge?
Intervention or response: To understand stigma-related barriers, The Union, conducted focus group discussions (FGDs) in Telangana (January–April 2024) with a combination of urban and rural populations. Six groups-participants: students, married women, and workingmen,

providing insights on TB perceptions and possible solutions. Findings revealed that stigma places a heavy mental burden on TB patients and negatively impacts treatment adherence. Participants suggested that sharing success stories and doctor-led counselling through social media videos could normalize TB discussions and promote early diagnosis and treatment.

Based on these insights, a Short Film Contest was held across Telangana in collaboration with colleges and universities. Total of 45(~850 youth directly involved) short films were submitted, the jury announced the best three films from the submissions and awarded the cash prizes on the World TB Day 2024. Winning films were then screened for focus groups to assess their impact.

Results/Impact: 90% of participants showed improved TB knowledge after watching the films.

85% believed the content was engaging and impactful.

80% of those who once stigmatized TB patients said they now support them.

Telangana is utilizing these films in the outreach as the above results directly contribute to the TB elimination efforts.

Conclusions: Engaging youth as partners empowered them to create authentic, relatable content using storytelling. This approach proved effective in reducing stigma, fostering empathy, and promoting early diagnosis and treatment adherence—highlighting the potential of creative, youth-driven advocacy in public health programs.

SOA01-510-18 Differences in social networks of children and youth with and without incident TB infection in rural Uganda

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Background: Social network analysis can elucidate TB transmission dynamics by identifying person-to-person links and shared behaviors that increase TB risk. There are few studies examining social networks among children and youth.

Design/Methods: In the SONET study in 25 rural communities in Southwestern Uganda, we conducted QuantiFERON-Plus (QFT) testing on children/youth (aged 1-23 years) at baseline and one-year later. Among cases (QFT conversion from negative-to-positive) and age/location-matched controls (remained QFT negative), we administered surveys to elucidate social contacts.

We visualized the resulting egocentric networks, calculated egocentric network metrics (size, closeness, betweenness) and characteristics of people in their social networks (age, sex, TB infection) using t-tests and chi-square tests.

Results: Among the 3,290 SONET baseline-negative participants completing a follow-up QFT, 66 (2%) had incident TB. Among cases and eligible matched controls 60/66 (91%) and 579/601 (96%) completed the social-network survey in this nested study.

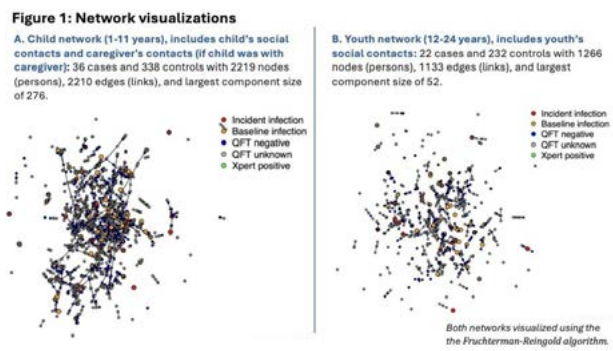

Figure 1 shows network for children (age 1-11 years) and youth (aged 12-23 years). Child cases (N=36) had similar network structures compared to controls (N=340) but were twice as likely to have a close contact with TB (31%

vs. 15%, p=0.03) and three-times as likely to have highly mobile contacts (28% vs. 9%, p<0.01). Youth cases (N=24) had significantly more contacts/network size (median 6 vs. 4; p=0.04) than controls (N=232) but similar network structure metrics otherwise. Youth cases also tended to have more close contacts with TB (17% vs. 7%, p=0.11) and highly mobile contacts (33% vs. 19%, p=0.09).
Conclusions: Children and youth with incident TB infection had significantly different social mixing patterns compared to controls, including more social contacts among youth, more highly mobile contacts and contacts with TB infection among children. Leveraging social-networks to enhance case-finding and identify children at higher risk for TB could be promising strategies warranting further study.

SOA02 Eyes on the Unseen: Leveraging data, tech, and community in finding the missing people with TB

SOA02-511-18 Reaching the undiagnosed: The contribution of active TB case finding campaign in Zambia

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Background and challenges to implementation: Active Case Finding (ACF) is a proactive approach that seeks to identify individuals with tuberculosis (TB) who may otherwise go undiagnosed. Despite achieving over 90% TB treatment coverage in Zambia in 2022 and 2023 , approximately 4,000 TB cases were missed in 2023. In early 2024, TB notifications declined.The National TB Programme, in collaboration with its partners, implemented two rounds of ACF campaigns in 2024 to strengthen TB case detection and maintain progress toward End TB Strategy targets.
Up until 2021, our treatment coverage was below 90%
Intervention or response: The first Active Case Finding campaign (June–August 2024) involved nationwide community and facility-level screening in high-burden hotspots through contact investigation, mobile diagnostic units (MDUs), and intensified screening. Simultaneously, health facilities were instructed to conduct routine TB screening at all service points. The second campaign, termed "Active Case Finding Reloaded" (September–December 2024), took a more targeted approach, focusing on health facilities that historically contributed 80% of national TB notifications. Facilities developed tailored microplans, supported by enhanced stakeholder engagement, virtual orientations, and training on data collection using Kobo Collect.
Results/Impact: The first Active Case Finding campaign contributed 13,367(28%) of Zambia's total notifications in 2024. The second campaign, implemented between September and December, accounted for 9,200 (60%) of the 15,334 notifications during that period of the annual total. Combined, both campaigns contributed 22,567 TB notifications, representing approximately 47.5% of the 47,186 total national TB notifications in 2024.
Conclusions: The dual Active Case Finding campaigns significantly improved TB detection by combining wide-reaching community outreach with targeted, data-driven

facility-based strategies. To sustain these gains, Active Case Finding should be integrated with broader public health efforts, and sustained funding is critical to achieve TB elimination goals. These results underscore the critical role of intensified Active Case Finding in improving TB detection.

SOA02-512-18 Reaching the unreached: India's 100-Day Drive to find every missing TB case

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Background and challenges to implementation: India has significantly reduced its burden of missing tuberculosis (TB) cases—from an estimated 1.5 million in 2015 to 150,000 in 2024. As the country moves closer to its TB elimination target, the National Tuberculosis Elimination Program (NTEP) identified the need to intensify efforts to detect undiagnosed cases, particularly among vulnerable and asymptomatic individuals.
While active case finding has been a routine component since 2017, the scale and intensity required to reach the unreached necessitated a newer and more aggressive approach.
Intervention or response: NTEP launched a 100-day intensified campaign from December 2024 to March 2025 across 347 priority districts, selected based on high TB mortality, low testing rates, and estimated disease prevalence. The campaign augmented routine case finding through systematic community screening of vulnerable populations using a 10-symptom checklist and chest X-rays, followed by molecular testing for diagnosis. Concurrently, the campaign targeted the saturation of nutrition support through the Ni-kshay Poshan Yojana (direct benefit transfers) and the Ni-kshay Mitra program (community-led food support initiative). Active participation of community, public and private stakeholders was secured in the campaign.
Results/Impact: The campaign covered a population of 619 million, screening 93,238,574 individuals. Of these, 1,704,321 underwent NAAT, resulting in the detection of 140,262 TB cases among vulnerable populations. In total, 312,962 TB cases were notified across sectors during the campaign. Notably, 42% (132,200) of the TB cases detected were asymptomatic. Chest X-ray usage increased 33-fold compared to the same period in the previous year, while molecular testing rose 2.3-fold. The number needed to screen (NNS) was 665.
Conclusions: The campaign demonstrated that intensive community outreach, strategic use of radiological and molecular diagnostics, and multisectoral engagement can significantly enhance TB case detection. These learnings provide a replicable model for high-burden settings seeking to close remaining detection gaps in the path to TB elimination.

SOA02-513-18 Reaching the unreached: Leveraging community volunteers and color cards to enhance TB case finding and adherence in Ethiopia's pastoralist areas

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge, with one-third of cases in Ethiopia undiagnosed or unreported annually. This issue is severe in pastoralist communities due to mobility, limited healthcare access, and low health-seeking behavior. Addressing these gaps requires culturally acceptable, community-driven interventions.
This study evaluates the effectiveness of engaging community volunteers in identifying missed TB cases, improving treatment adherence, and enhancing community participation in Ethiopia's pastoralist settings.
Intervention or response: A pilot intervention engaged 50 trusted community volunteers, including TB survivors, religious and clan leaders, women's association members, and community elders. Volunteers received three days of training on TB awareness, case identification, patient referral, and treatment adherence.
A specialized Color Card referral system, treatment monitoring tools, and IEC/BCC materials were introduced. Volunteers incorporated TB activities into social interactions, ensuring minimal disruption to their livelihoods. Dedicated personnel provided ongoing support and monitored the intervention's impact.
Results/Impact: Over nine months, volunteers screened 12,464 community members, identifying 1,103 presumptive TB cases, with 94.7% (1,104) tested using molecular diagnostics. Volunteers contributed 12% (69/575) of total TB case notifications, with a notification rate of 553/10^5 population—four times the regional target (139/10^5). This intervention contribute by 8% to increased annual case detection from 60% to 70%.
Additionally, 75 (13%) of notified cases received home-based adherence support. Seven drug-resistant TB (DR-TB) cases were detected, whereas none had been reported in the past two years. Qualitative findings highlighted in-

creased community awareness and engagement. One volunteer stated, *"Before this initiative, I didn't realize TB was so prevalent in our community."*

Conclusions: This community-led approach successfully identified missed TB cases, reduced costs, and improved treatment outcomes. Strengthening community engagement in TB programs, especially in pastoralist settings, is crucial for achieving End TB goals. Scaling up similar interventions can accelerate progress toward TB elimination in Ethiopia and beyond.

SOA02-514-18 Community involvement in active TB case finding in Indonesia: Two heads are better than one

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Background and challenges to implementation: Community involvement in accelerating TB elimination by 2030 is one of Indonesia's national strategies for tuberculosis. The Penabulu-STPI Consortium, as the principal recipient of GF TB Community Cycle 7, describes our experience in engaging communities to actively find TB cases.

Intervention or response: This activity was carried out from January to December 2024 across 190 districts in 30 provinces in Indonesia. The implementation stages included national, provincial, and district coordination meetings involving TB programmers and stakeholders dan setting up the targets. In the role division, the community prepares cadres, while TB programmers handle TB services.

Cadre preparation involves updating modules, mapping and recruiting cadres, and providing training. The target for TB case finding includes contact persons of TB index cases through contact investigations, and individuals at risk through community outreach.

Cadres screen for TB symptoms and risk factors, refer individuals to health facilities and assist with sputum collection if necessary. Monitoring is carried out biweekly, with supervision in low-performance areas. Recording and reporting are conducted via a community information system, with results validated against the national TB information system.

Results/Impact: Of the 14,195 cadres trained, 10,222 (72%) conducted screenings across 190 districts in 30 provinces. Of the 5,162,167 contact persons/individuals at risk screened, 2,270,726 (44%) were referred to HFs, 1,628,852 (78%) were tested for TB, and 174,554 (11%) were diagnosed with TB, yielding a 3.4% TB rate.

Suboptimal referrals pose challenges due to high stigma, difficult geography, and issues with cadres' activity and coordination with HFs regarding feedback on referral results. The community contributed 29% (174,554/608,564) of the total TB cases reported in the national TB information system.

Conclusions: Community engagement is crucial in actively screening TB cases. However, effective coordination, strategic planning, and consistent monitoring are essential to ensure the optimal implementation of activities.

SOA02-515-18 Strengthening active case finding for tuberculosis advocacy in Chinese media: A practice-driven case study of communication interventions

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Background and challenges to implementation: Recent report suggest that 50–70% of tuberculosis (TB) transmission occurs before a definitive diagnosis is made. In China, the median delay in seeking healthcare is 29 days, and many asymptomatic cases remain undetected. Although active case finding (ACF) is key to The End TB Strategy, mainstream Chinese media have paid scant attention.

This study aims to enhance the quality of media coverage on ACF in China, raising public awareness and supporting the goal of "end the global TB epidemic" by 2035.

Intervention or response: Initial exploratory interviews with 12 journalists from 11 media organizations were conducted to understand their views regarding ACF and to identify areas of confusion and reporting challenges. Based on these insights, 37 key media outlets (state-owned and commercial outlets) were selected for targeted interventions to ensure broad coverage and strategic influence. Tailored interventions were then implemented according to journalist profiles: for most journalists, seminars were held on key dates; senior reporters joined field media trips; early-career journalists participated in industry conferences; and all received ongoing support through updated media kits and access to CDC experts. Finally, the effectiveness of these interventions was assessed via media monitoring, in-depth interviews, and following-up surveys.

Results/Impact: Overall, 47 journalists published a total of 77 reports on ACF. Based on a follow-up survey of participating journalists (N=43), all respondents reported improved understanding of and willingness to report on ACF; 90.1% observed increases in the quantity and quality of reporting on ACF, and 79.1% of respondents believed that the engagement contributed to creating a more favorable environment for addressing the critical aspects of ACF. Further implications from in-depth interviews (N=12) were also revealed.
Conclusions: Overall, this media engagement effectively stimulated mainstream discourse on ACF and contributed to a supportive environment for TB elimination, underscoring the importance of accurate messaging, strategic timing, and strong government support.

SOA02-516-18 Systematic community TB screening using digital X-ray and live data monitoring to improve TB case findings in rural Lesotho

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Background and challenges to implementation: The 2019 Lesotho tuberculosis (TB) prevalence survey showed that symptomatic TB screening missed 70% of TB cases, while digital X-ray showed a sensitivity of 98% compared to culture. An innovative screening algorithm is needed to close the 58% of missing TB cases in Lesotho. This study aims to assess the outcome of TB screening using digital X-ray and risk factor screening at remote, hard-to-reach health centers.
Intervention or response: TB screening is based on symptoms, and there are no dedicated TB screeners at the health facilities in Lesotho. As a result, many TB cases were missed due to a less sensitive screening algorithm.
Results/Impact: In 2022, Partners In Health (PIH) implemented a revised TB screening algorithm. It also incorporated a digital x-ray with a computer-aided detection system (CAD), symptomatic and risk factor screening, and Geographic Information System (GIS) to identify community TB hotspots in seven hard-to-reach rural health facilities. PIH hired trained health workers in each health facility including a radiologist to provide timely feedback on the x-ray images. PIH introduced a live data-monitoring tool using an app called the TB Hunter system for timely monitoring of TB performance.
The intervention was assessed using descriptive analysis from June to July 2021 pre-intervention and June to July 2024 during intervention. Despite the decrease in screenings by 15% in 2024, TB case findings increased by 3.3 times during the intervention period. This is 93% of the annual performance target in 2024, while only 28% in 2021, based on the estimated national TB incidence of 664/100000 population and 89000 population in the catchment area of the health centers.
Conclusions: Implementing a sensitive TB screening algorithm with live data performance monitoring in remote, hard-to-reach health facilities was highly effective in improving TB detection. Investing in staff, systems (CAD, GIS), and stuff (digital x-rays, diagnostics) can improve TB detection.

SOA02-517-18 Leveraging a mass religious gathering for intensified tuberculosis case finding: Insights from the Maha Kumbh Mela, Prayagraj, India

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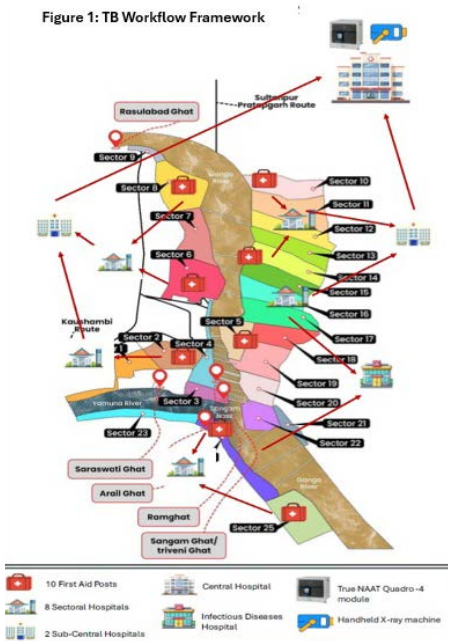
Background and challenges to implementation: Maha Kumbh Mela(MKM), Prayagraj, Uttar Pradesh(UP), is world's largest gathering of religious pilgrims. It attracts diverse array of ascetics, saints, and pilgrims from various backgrounds every 12 years, spanning for 45 days. MKM provided a critical public health opportunity to enhance tuberculosis(TB) case detection among a mobile population. With support from UP government, large-scale targeted TB interventions were implemented in this unique congregate setting. By focusing on proactive planning, coordination, and use of digital tools, the study seeks to assess, potential impact of these initiatives on TB elimination efforts.
Intervention or response: Systematic planning established decentralized health services in MKM area (Figure-1), featuring health service delivery points at one central hospital, two sub-central hospitals, eight sectoral hospitals, and ten first aid posts in the MKM, which was visited by 10 million pilgrims daily. TB services were integrated at all delivery points and NAAT and portable X-ray units were made available for real time diagnosis.
Sample collection system was established comprising NTEP volunteers. Intensified TB Diagnostic and treatment algorithm under National TB Elimination Program were followed. Community engagement was bolstered

through 24×7 loudspeaker-announcements, visual-materials, and religious leaders' involvement. Data from Nikshay was analyzed to evaluate intervention's impact on TB care cascade from January 12 to February 26, 2025, using R version 4.2.3.

Results/Impact: 52,711 individuals were screened for TB (Figure-2). Of these, 1023 willing asymptomatic individuals were subjected to XRays, of whom 750 individuals found to have abnormal Xray were subjected to NAAT-testing with 726 symptomatic individuals identified during screening.

Overall, 1,476 NAAT evaluations were done, resulting in prompt management of TB presumptives. 1,650 individuals were successfully enrolled in the national Ni-kshay system for continued care and follow-up.



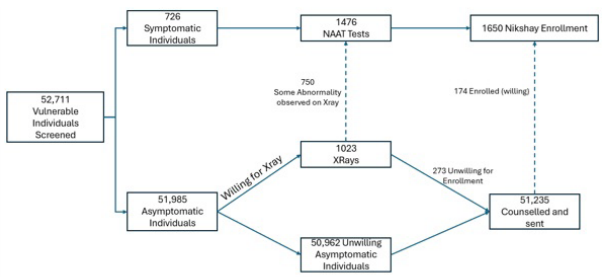


Figure 2: Flow of Beneficiaries during Kumbh Mela

Conclusions: MKM campaign showcased effectiveness of using large gatherings for disease surveillance and public health actions, emphasizing proactive planning, interdepartmental coordination, and digital integration for scalable TB interventions globally.

SOA02-518-18 Hidden no more: Community-led tuberculosis detection among street families in Kenya

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Background and challenges to implementation: Despite progress in TB control, street families globally remain at high risk of infection due to poor living conditions, malnutrition, and limited access to healthcare. Kenya, categorized as one of 30 high TB burden countries, factors such as stigma, mobility, and financial constraints delay diagnosis and perpetuate transmission among this vulnerable group. The 2019 census recorded 20,101 street-dwelling individuals in Kenya, with urban areas, characterized by high population density and frequent interaction, experiencing a higher transmission rate than rural areas.

In response, Amref with support from Global Fund and in collaboration with its Sub recipients and National TB Programme, initiated a series of community-led TB outreach activities tailored to the unique needs of this population.

Intervention or response: From 2023 to 2024, five TB outreaches were conducted in Kisumu, Nakuru, Kitui, and Chuka—urban areas hosting around 10% of Kenya's street families. Community Health Promoters (CHPs), trusted by these communities, mapped hotspots and mobilized participants. Services were delivered on-site, including TB education, symptom screening using standard tools, chest X-rays, and where indicated, sputum collection and GeneXpert testing. Mobile data tools enabled real-time reporting. CHPs also supported contact tracing and follow-up to ensure treatment adherence and continuity of care.

Results/Impact: Symptomatic screening was conducted to a total of 1,326 individuals, 986 (74%) had TB symptoms. Chest X-rays were performed on 909 individuals, with 319 showing abnormalities warranting sputum tests. 46 people were diagnosed with TB (3.5% yield), higher than average outreach yields (1–2%). All were promptly initiated on treatment. CHPs provided consistent follow-up, supporting adherence and continuity of care.

Conclusions: A community-led, mobile model proved effective in improving TB detection and treatment among street families. This inclusive approach can be adapted to other vulnerable populations to close equity gaps in TB response.

SOA02-519-18 Active TB screening and case finding among individuals undergoing Methadone treatment at Ngara Methadone Clinic in Nairobi County, Kenya

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Background and challenges to implementation: People who use drugs show a higher incidence and prevalence of tuberculosis than people who do not use drugs. For people who use drugs, exposure to *M tuberculosis* is amplified in environments such as places where drugs are used, dormitories and homeless shelters, police holding facilities, prisons, health-care centers such as methadone or HIV clinics, and rehabilitation centers, referred to as "institutional tuberculosis amplifiers".
In 2024, Nairobi recorded 140 tuberculosis (TB) cases among this population, with 7 cases (5%) involving clients enrolled in the methadone program. To address the notable prevalence of TB within this group, the County, had an active TB screening initiative specifically targeting clients at Ngara Health Center, one of Nairobi's largest methadone clinics.
Intervention or response: In March 2025, the County conducted a two-day tuberculosis screening initiative at Ngara Methadone Clinic. All clients attending the clinic for their daily methadone dose were sensitized about Tuberculosis screening. Those who consented underwent an initial digital chest X-ray. Those with abnormal chest X-ray findings were further assessed by clinicians and referred for Gene Xpert test.
Results/Impact: A total of 529 methadone clients received tuberculosis (TB) messages and counseling, comprising 452 (85%) males and 77 (15%) females. About 125 (24%) clients were screened for TB using digital X-ray, of which 113 (90%) were males. Of those screened, 109 (87%) clients (102 males and 7 females) had normal X-rays, while 16 (9%) clients (14 males and 2 females) had abnormal findings (score >60) and were subjected to gene xpert test. In total, 8 TB cases were diagnosed (5 bacteriologically and 3 clinically diagnosed), all of which were male.
Conclusions: Prioritizing individuals on methadone programs as a key and vulnerable group for TB is essential. This includes the development of an inclusive strategy and implementation of community-based interventions tailored to the needs of people who use drugs.

SOA02-520-18 Sensitivity and specificity of symptom-based screening among household contacts of tuberculosis patients in high TB burden countries

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Background: Systematic screening for tuberculosis (TB) is essential in household contacts (HHCs) of persons with TB for case finding and ruling out active TB prior to TB preventive treatment. While symptom screening remains one of the WHO recommended screening tools, data on its accuracy in HHCs are limited. We evaluated the accuracy of symptom screening among HHCs in two high TB burden countries.
Design/Methods: The analysis included HHCs of index persons with microbiologically confirmed TB in South Africa and Lesotho, enrolled in the CUT-TB trial. The analysis was restricted to participants in the universal testing arm that provided sputum samples for GeneXpert ultra (reference standard) testing regardless of symptoms. Cough and other TB-related symptoms were assessed based on age group (Table).
We excluded contacts less than five years since they were required to provide sputum only if symptomatic.

	Screening tools	True Positive	False Positive	True Negative	False Negative	Sensitivity % (95% CI)	Specificity % (95% CI)
Overall (n= 1495)	Cough	5	112	1363	15	25,0 (8,7 - 49,1)	92,4 (90,9 - 93,7)
	*Any symptom	5	161	1314	15	25,0 (8,7 - 49,1)	89,1 (87,4 - 90,6)
<15 years (n= 425)	Cough	1	28	394	2	33,3 (0,8 - 90,6)	93,4 (90,6 - 95,5)
	Any symptom	1	63	359	2	33,3 (0,8 - 90,6)	85,1 (81,3 - 88,3)
≥ 15 years (n= 1070)	Cough	4	84	969	13	23,5 (6,8 - 49,9)	92,0 (90,2 - 93,6)
	Any symptom	4	98	955	13	23,5 (6,8 - 49,9)	90,7 (88,8 - 92,4)

*1329 contacts reported no symptoms, 140 contacts reported 1 symptom, 19 contacts reported 2 symptoms, 6 contacts reported 3 symptoms and 1 reported 4 symptoms. Any symptom refers to presence of any cough, fever, loss of appetite, wheezing, neck swelling or fatigue in contacts ≤ 15 years in Lesotho and ≤ 10 years and presence of any cough, fever, weight loss or night sweats for contacts >15 years in Lesotho and >10 years in South Africa

Table. Sensitivity and specificity of symptom-based screening among contacts of microbiologically confirmed TB patients.

Results: A total of 1495 contacts were included; 805 (53.8%) in South Africa and 690 (46.2%) in Lesotho. Contacts median age was 25 years (Interquartile range [IQR] 13-46 years) and majority were female (908 (60.7%)). TB was diagnosed in 20 (1.3%) contacts.
Any cough had a sensitivity of 25.0% (95% confidence interval [CI] 8.7-49.1%) and a specificity of 92.4% (95%CI 90.9-93.7%), while the presence of at least one symptom had a sensitivity of 25.0% (95%CI 8.7-49.1%) and a specificity of 89.1% (95%CI 87.4.2-90.6%). When stratified by age group, the results were similar (Table).
Reporting at least one symptom among contacts <15 years had a sensitivity of 23.3% (95% CI 6.8-49.9%) and a specificity of 90.7% (95%CI 88.8-92.4%) while contacts ≥15 years had a sensitivity of 23.5% (95% CI 6.8-49.9%) and a specificity of 92.0% (95%CI 90.2-93.6%).
Conclusions: When using a GeneXpert Ultra reference, symptom screening had low sensitivity among household contacts, substantially lower than estimates from the systematic review that informed current WHO guidelines.

SOA02-521-18 Impact of using the 10-symptom complex for tuberculosis (TB) screening on program indicators during the 100-day Intensified TB Case Finding campaign in Chandigarh, India

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Background and challenges to implementation: The Union Territory (UT) of Chandigarh implemented the Government of India's 100-day intensified TB case-finding campaign, which aimed at active case-finding and community engagement, providing an opportunity to strengthen the National TB Elimination Program (NTEP) indicators within Chandigarh. During the campaign, the 4-Symptom screening tool (cough, fever, weight loss, and night sweats) was expanded to 10S (cough, fever, night sweats, haemoptysis, chest pain, shortness of breath, weight loss, loss of appetite, fatigue and swelling in the neck and other extrapulmonary symptoms).
The study aims to understand the effectiveness of this expanded 10-symptom screening tool on TB care cascade, among the vulnerable population.
Intervention or response: Chandigarh's National Tuberculosis Elimination Program (NTEP) implemented the 10-symptom screening tool under the 100-day intensified TB case finding campaign targeted to the vulnerable population. All medical officers, staff, and community volunteers were trained to identify ten TB symptoms. Three mobile vans equipped with AI-powered handheld X-rays conducted 178 camps over 100 days, ensuring comprehensive screening. Data from Ni-kshay, India's TB digital surveillance system, was analysed, comparing December 2023- March 2024 with December 2024- March 2025, to evaluate the effectiveness of the campaign on program performance.
Results/Impact: The expanded screening tool delivered significant outcomes in Chandigarh (*Table 1.*)

	Dec. 23 to March 24	Dec. 24 to March 25	% change
Presumptive cases identified and enrolled on Nikshay	9633	44570	+371%
Diagnostic tests conducted - X-rays	9467	21750	+130%
Diagnostic tests conducted – NAAT	5231	12195	+133%
Total case notification	2098	2321	+11%

Table 1: Key NTEP Indicators in Chandigarh.

The use of an expanded 10-S symptom complex has shown a significant increase in the identification of presumptive cases, NAAT, and X-ray utilization, thereby an overall 11% increase in case notification during that period ($p<0.05$).
Conclusions: The study indicates that broadening the symptom complex for TB screening can significantly enhance TB case identification and testing for TB in the high-risk vulnerable groups. By doing so, healthcare providers could enhance the accuracy of identifying individuals at risk for TB, leading to earlier diagnosis and treatment. This approach underscores the importance of comprehensive screening protocols in effectively combating the disease and reducing transmission rates.

SOA02-522-18 Enhancing TB case detection: A comparative study of AI-identified versus routine data-derived hotspots in Pakistan

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Background: Despite significant improvements in recent years for active case-finding (ACF) for tuberculosis (TB), a gap of 30% (205,864 missing TB cases) exists between case notification & expected incidence in Pakistan in 2023. Yields of ACF have been lower raising concerns about its effectiveness in programmatic settings.
The primary aim of this trial is to investigate whether using a geographically targeted approach supported by artificial intelligence (AI), MATCH-AI, can improve the yield of ACF in Pakistan.
Design/Methods: A stepped-wedge cluster randomized trial is being implemented across 65 districts in Pakistan to evaluate the effectiveness of AI versus routine targeting strategy for ACF. Data collection is ongoing, spanning from October 2023 to April 2025, with data for 14 months with 5000+ screening activities (camps) available and preliminary results can be presented. Site-selection for ACF in the intervention areas is guided using MATCH-AI software that models sub-district TB prevalence & identifies hotspots.
Control areas were selected using existing approaches for hotspot selection. The primary outcome measure is number of bacteriologically confirmed TB cases detected in both groups.
Results: Our preliminary results included data analysis of total 6190 camps, with 891 (locations for 1099 camps are not verified yet) camps on the intervention side & 4200 camps on the control side. The yield of bacteriologically positive cases across AI camp sites was 2.1% in comparison to 1.9% in camps selected through the conventional approaches.
A higher number of camp attendance was noticed in camps selected through conventional method with an average number of 69.2 ± 22 participants versus 67.3 ± 18.9 in the intervention camps.

		AI camps	Non-AI camps
1	Total Camps	891	4200
2	Total number of camp participants	60,001	290,748
3	Average number of camp participantss	67.3 ± 18.9	69.2 ± 22
3	Tests conducted on Xpert	9,661	41,527
4	Yield for Bacteriologically +ve cases	2.1%	1.9%
5	Detection rate/100,000 people	2082	1945

Table.

Conclusions: The trial, if proven successful, will help inform whether a targeted approach for ACF in high TB burden countries is effective & feasible. Hotspot identification using MATCH AI, could enhance TB case detection & lower the burden of missing TB cases in Pakistan.

E-POSTER SESSION (EP)

EP01 Next-gen technology for TB: Bridging the gaps in surveillance, diagnosis, and treatment

EP01-700-18 The use of technological innovation (MATS App) to improve TB case finding in PPM intervention: The Katsina State experience

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in Nigeria, particularly in Katsina State, where barriers to early diagnosis persist. KNCV Nigeria, with funding from Global Fund, is implementing the Public-Private-Mix (PPM) TB screening activities in Katsina state, taking services to the doorstep of the patients in the communities.
This study explores the impact of the Mobile Application for TB Screening (MATS App) on enhancing TB case finding in some selected facilities within the Public-Private Mix (PPM) intervention in Katsina State.
Intervention or response: This is a retrospective review of Program-level data for KNCV-implemented PPM TB screening activities for April,2024 and July, 2024 in Katsina State. The MATS App was deployed in selected PPM facilities across Katsina State in July 2024, and healthcare providers received comprehensive training on its usage. Data on TB case finding was gathered before and after the app's implementation for comparison.
Results/Impact: The introduction of the MATS App in July 2024 resulted in a marked increase in TB case finding. Quantitative analysis revealed a 171% increase in presumptive TB case identification and 391% increase in identified TB cases within one-month post-implementation as shown in the figure below.

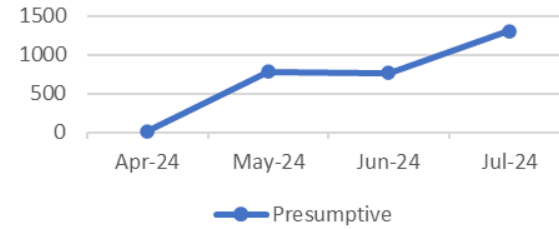

Figure. Presumptive TB identification trend.

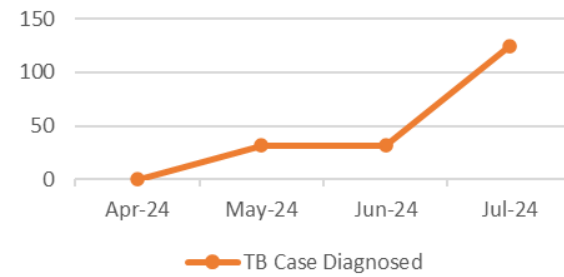

Figure. TB case notification trend.

Conclusions: Deploying the MATS App Technology significantly improved TB case finding in Katsina State's PPM intervention. Its user-friendly interface improved efficiency in TB screening and real-time reporting capabilities streamlined TB screening and management processes.
This study underscores the potential of technological innovations like the MATS App to bolster TB control efforts in resource-limited settings. Expanding the use of such technologies across the PPM facilities in the state and other regions could further aid in the global fight against TB.

EP01-701-18 Leveraging health information systems to diagnose health system performance: Insights from the Global Fund PPM grant using CommTB in Katsina, Nigeria

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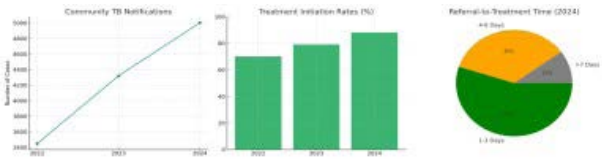
Background and challenges to implementation: In Katsina State, Nigeria, tuberculosis (TB) control efforts increasingly rely on the integration of community-level actors, particularly through the Public-Private Mix (PPM) model supported by the Global Fund. Central to this model is the deployment of the CommTB mobile application, used by Community-Based Organizations (CBOs) for community TB screening, identification, and real-time reporting. CommTB bridges data gaps between community TB activities and the national health system, enabling performance tracking and timely case management.
Intervention or response: This retrospective evaluation covers CommTB data from September 2023 to December 2024, collected by 3 CBO-s across Katsina State. CBOs used CommTB to document presumptive TB cases iden-

tified during outreach, referrals made, diagnostic confirmation, and treatment initiation. Data were extracted from the CommTB dashboard and cross-validated with state TB program records. Analysis focused on trends in community TB case notifications, referral-to-treatment turnaround, and system responsiveness.
Results/Impact: Community TB Case Notifications: Notifications increased by 45%, from 3,450 in 2023 to 5,003 in 2024.
- Referral-to-Treatment Efficiency: The average referral-to-treatment time dropped from 7 days to 3 days, driven by CBO-led navigation and CommTB alerts.
- Treatment Initiation Rate: Initiation improved from 70% in 2023 to 88% in 2024.
- Data Quality: CommTB-enabled reporting achieved over 90% completeness across key fields including symptom tracking, referral status, and treatment outcome.



Conclusions: The use of CommTB by community actors in Katsina has enhanced the visibility, responsiveness, and effectiveness of TB services under the GF PPM model. Real-time data from the field informs program decisions, accelerates linkage to care, and showcases the power of digital tools in decentralized TB surveillance.

EP01-702-18 IVRS-based cough tracking for early TB diagnosis among individuals purchasing cough syrups from local practitioners

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge, with many cases missed due to delayed care-seeking, misdiagnosis, and lack of timely referrals by local practitioners. In India Often the first point of contact, providers like chemists, traditional medicine (AYUSH) practitioners, and RHPs lack systems for tracking symptoms and making timely referrals results in missed chances for early TB diagnosis. Under the USAID-supported, JSI-led TIFA TCG grant, we're using IVRS (Interactive Voice Response System) to monitor individuals buying cough syrup and refer persistent cough cases for TB testing.
Intervention or response: The project uses the TB Mukt Himachal mobile app to record cough syrup distribution details, including the individual's name, age, mobile number, syrup type, and cough duration. This data generates a weekly line list shared with the IVRS team for two automated follow-up calls on Day 7 and Day 14.
The first call checks cough persistence and, advising testing for presumed TB cases. The second call follows up with untested individuals.
After second call, Non-responders and untested cases are referred to health workers for further follow-up. The primary outcome is the proportion of tested presumed TB cases, with secondary outcomes including IVRS responses, TB positivity, and completion rates.
Results/Impact: Between October and December 2024, the IVRS initiative tracked 35,348 individuals who received cough syrup from 6,464 local practitioners. Calls were connected to 21,486 (61%) individuals, with 5,821 (27%) responding to the first call about their cough status. Of those, 2,287 (39%) reported a persistent cough and were advised to test for TB. In the second call, 841 (36.8%) confirmed TB testing, and 48 (6%) were diagnosed with TB.
Conclusions: The IVRS initiative improved TB case finding with 6% positivity, but a 73% non-response rate calls for better engagement strategies.

EP01-703-18 Helping household TB contacts navigate the contact tracing cascade using a WhatsApp chatbot under South Africa's universal testing policy: Findings from Shesha

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Background: South Africa's universal TB testing policy requires that all household contacts of TB patients be tested microbiologically and, if eligible, start treatment or tuberculosis preventive therapy (TPT). While necessary, this policy increases the workload of community health workers (CHWs), who cannot feasibly follow-up every contact. To address this, we developed Shesha, a WhatsApp-based chatbot to deliver results, guide contacts through each step of the contact tracing cascade and enable them to self-report progress; placing more control in their hands.
Design/Methods: We developed Shesha over six-months in 2023 and implemented it for 19 months from September 2023. CHWs assisted only with registration during

first household visits. Thereafter, contacts engaged independently with Shesha on WhatsApp, receiving automated push messages to access their results, receive guidance, and report clinic visits, starting treatment and post-treatment activities.
We analysed chatbot data to assess engagement, TB test result receipt, and user-reported progression along the cascade.
We conducted qualitative interviews using the Unified Theory of Acceptance and Use of Technology (UTAUT) to explore perceived usefulness, ease of use, and behavioural intention.
Results: We approached over 445 contacts and enrolled 354. Among those not enrolled, 56% lacked WhatsApp-compatible phones and 41% were underage. Of the 354 enrolled, 315 (89%) opted in. Through Shesha, 236 (75%) received TB test results, 46 (15%) reported clinic visits, and 30 (10%) reported initiating treatment or TPT. Sixty-seven contacts gave reasons for not attending, including time constraints (31%), feeling healthy (16%), financial barriers (15%), work-related commitments (10%), childcare, and lack of nearby clinics (3% each).
Nineteen percent reported varied personal reasons. Interviews showed users valued receiving results, though many felt well and did not see a need for TPT.
Conclusions: Shesha demonstrated high early engagement and helped automate follow-up. However, limited downstream reporting reflected broader barriers to TPT uptake and the limits of self-reporting alone.

EP01-704-18 Innovative connectivity solution enhanced enrolment and management in Nigeria of people with drug-resistant TB and HIV in Nigeria

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Background and challenges to implementation: Nigeria holds the highest burden of tuberculosis (TB) in Africa and ranks sixth globally among high TB burden countries. The country accounts for a significant portion of the global TB incidence and is also heavily affected by drug-resistant TB (DR-TB) and HIV-associated TB. The country relies on GeneXpert MTB/RIF machines to diagnose DR-TB at multiple clinical locations.
However, reporting TB testing results is lengthy due to continued reliance on paper records and slow data transit systems. The quality of results data is often poor, and subsequent program management decisions are not always timely or focused on priority needs.
Intervention or response: Nigeria relies on a cost-effective, innovative solution that sends GeneXpert diagnostic results to key health system actors instantly to enable quick enrollment of newly diagnosed patients in a DR-TB treatment program.
GxAlert is configured on GeneXpert systems, and connectivity is provided by local telecom to send encrypted data to the secure web-based GxAlert database in real time and with the capability to send diagnostic test results out to national programs, supervisors, clinicians, and patients via SMS text, email, and web dashboard or by connecting into existing M&E, patient record, or case management tools already in use.
Results/Impact: The proportion of DR-TB patients enrolled for treatment based on GxAlert messages received from 348 GeneXpert facilities jumped to 89% in January 2024 from only 70% enrolled in April 2022. This innovation has made it possible to get diagnostics results immediately back to clinicians and patients and improved the focus of diagnoses.
Conclusions: Using GxAlert SMS notification for GeneXpert testing suggests a scalable model for sustainability. Lessons learned include: Installation is done once and locally. Technology is kept simple as local telecom connectivity solutions are required and are readily available and affordable for GxAlert connectivity.

EP01-705-18 Reducing diagnostic delays through a radiology information system in Kirovohradska oblast, Ukraine

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Background and challenges to implementation: In Ukraine, radiology workflows have traditionally relied on manual processes: images are shared via flash drives or radiologists travel to central facilities for X-ray interpretation. These same processes was used when conducting TB screenings with mobile X-ray in remote areas; interpretation was only possible once the team returned to the central facilities.
Further, Ukraine's health care system faces a shortage of experienced radiologists, leading to additional delays in X-ray interpretation and TB diagnosis.
Intervention or response: Since January 2025, the USAID-funded, PATH-led Support TB Control Efforts in Ukraine (STBCEU) project supported installation of a Radiology Information System (RIS) in the Kirovohrad TB facilities. The RIS provided centralized, cloud-based storage of X-ray images, allowing radiologists to access and interpret X-ray images remotely. It supported immediate image upload from any remote site, integration

with local and cloud-based medical information systems in DICOM format, and electronic result transfer to referring physicians. Family doctors could access images via QR codes or secure links. RIS also enabled comparison of X-ray with the radiological archive, reducing follow-up of patients with post-TB residual lung changes.

Results/Impact: Between January 31 and March 31, 2025, a total of 1,037 X-ray images were processed using the RIS. The average time required for a single doctor to interpret an X-ray was reduced to approximately 7 hours, compared to 96 hours per X-ray prior to the implementation of the RIS.

Additionally, the time needed to transmit results to the district level decreased to an average of 48 hours, down from an average of 432 hours before the introduction of the RIS.

Conclusions: The RIS implementation significantly streamlined the workflows of health care professionals. The system has facilitated both faster X-ray image processing and faster communication between health care providers, reducing delays in diagnosis and patient follow-up.

EP01-706-18 Prescription to notification: Digitizing drug sales in Uttar Pradesh

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health issue in India, where many patients first seek care in the private sector. In 2018, Tuberculosis (TB) was declared a notifiable disease in India. Uttar Pradesh (UP), contributing 16% of India's population and 33% of Anti Tuberculosis Treatment (ATT) drug sales, reported over 0.6 million TB cases in 2023, while the India TB Prevalence Survey 2019 estimated nearly 1 million, revealing a large notification gap. Inconsistent manual and digital record-keeping practices pose additional barriers to accurate ATT sales tracking. A centralized digital application to resolve these issues was piloted in Lucknow.

Intervention or response: A web /mobile based app was deployed in the pharmacies to capture patient-level drug sales data. Pharmacists were trained at state and facility levels on accurate data entry and app adoption.

Primary data (December 2024-February 2025) from the app was cross-matched with the notification register (January 2023-February 2025) using mobile numbers and gender to identify individuals undergoing treatment but not notified. Field verification validated the findings.

Results/Impact:

1. Total 300 patient drug sales were recorded and data triangulation showed that 69% (207/300) of patients recorded in the app were not notified in Nikshay. Field verification confirmed that 32% (97/300) were not reported but were under treatment.
2. ATT drug sales were recorded 697 times, involving 28 distinct drug formulations and accounting for 16,702 tablets dispensed.

Distribution of ATT Drug Formulations Captured Through Pharmacy App

Drug Name	Drug_Generic_Name	Packaging						Quantity Sold (Tablets)
		1*1	1*10	1*2	1*3	1*4	1*6	
Akt 2 Tablet			70					70
Akt 3 Kit	Rifampicin (450mg) + Isoniazid (300mg) + Ethambutol (800mg)	60		72				132
Akt 4 Kit	Isoniazid (300mg) + Rifampicin (450mg) + Ethambutol (800mg) + Pyrazinamide (750mg)	71	199	35		113		418
Akurit-3 Tablet	Rifampicin (150mg) + Isoniazid (75mg) + Ethambutol (275mg)		1325					1325
Akurit-4 Tablet	Isoniazid (75mg) + Rifampicin (150mg) + Ethambutol (275mg) + Pyrazinamide (400mg)		1670					1670
Combunex 800 Tablet	Isoniazid (300mg) + Ethambutol (800mg)		75					75
Combutol 1000 Tablet	Ethambutol (1000mg)		1183					1183
Combutol 200 Tablet	Ethambutol (200mg)		60					60
Combutol 400 Tablet	Ethambutol (400mg)		310					310
Combutol 600 Tablet	Ethambutol (600mg)		589					589
Combutol 800 Tablet	Ethambutol (800mg)		1425					1425
Forecox Tablet	Isoniazid (150mg) + Rifampicin (225mg) + Ethambutol (400mg) + Pyrazinamide (750mg)		158				164	322
Macox Plus Tablet	Rifampicin (450mg) + Isoniazid (300mg)						48	48
P Zide 1000 Tablet	Pyrazinamide (1000mg)		700					700
P Zide 500 Tablet	Pyrazinamide (500mg)		949					949
P Zide 750 Tablet	Pyrazinamide (750mg)		1314					1314
Pyzina 1000 Tablet	Pyrazinamide (1000mg)		10					10
Pyzina 500 Tablet	Pyrazinamide (500mg)		90					90
Pyzina 750 Tablet	Pyrazinamide (750mg)		110					110
R-Cin 300 Capsule	Rifampicin (300mg)		115					115
R-Cin 450 Capsule	Rifampicin (450mg)		763					763
R-Cin 600 Capsule	Rifampicin (600mg)		52		197			249
R-Cin Capsule	Rifampicin (150mg)		90					90
R-Cinex 600 Tablet	Rifampicin (600mg) + Isoniazid (300mg)		290		1174			1464
R-Cinex Capsule	Rifampicin (450mg) + Isoniazid (300mg)		2038					2038
R-Cinex E Tablet	Rifampicin (450mg) + Isoniazid (300mg) + Ethambutol (800mg)		12				126	138
Solonex DT Tablet	Isoniazid (100mg)		345					345
Solonex Tablet	Isoniazid (300mg)		700					700
Grand Total		**131**	**14642**	**107**	**1371**	**113**	**338**	**16702**

Conclusions: The pharmacy app pilot shows promise in bridging TB notification gaps and provides useful insights into private-sector ATT drug prescribing practices and sales. Accurate identification of missing cases dependent on thorough data triangulation and field verification, as drugs are often bought by others on behalf of individuals on treatment.

EP01-707-18 Portable digital X-ray (PDX) screening as a catalyst for early multi-drug resistant TB detection among contacts in high-burden settings: A cross-sectional study from Katsina, Nigeria

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Background: Multidrug-resistant tuberculosis (MDR-TB) remains a significant public health challenge, particularly in high-burden settings like Katsina, Nigeria. Traditional symptomatic screening methods often miss early or asymptomatic cases, leading to delayed diagnosis and ongoing transmission. Artificial intelligence (AI) aided portable digital X-ray (PDX) screening has emerged as a potential tool to enhance case detection. This study evaluates the effectiveness of PDX screening in enhancing MDR-TB case detection among close contacts of MDR-TB compared to symptomatic screening.
Design/Methods: A cross-sectional study was conducted among 587 close contacts of confirmed MDR-TB patients. Participants underwent both symptomatic and PDX screening. Those identified as presumptive cases were tested for MTB/Rif resistance using Gene Xpert or Truenat. The primary outcome measures were the number of drug susceptible tuberculosis (DSTB) and MDR-TB cases detected using each screening method. Data analysis included comparative proportions and percentage increases in case detection rates.
Results: PDX screening identified 145 presumptive cases (24.7%), compared to 98 cases (16.7%) via symptomatic screening. Confirmed TB cases were significantly higher with PDX screening (21 cases, 3.6%) than symptomatic screening (13 cases, 2.2%), representing a 61.5% increase. MDR-TB detection was markedly improved with PDX screening, identifying 15 cases (2.6%), compared to 6 cases (1.0%) through symptomatic screening— a 150% increase.
Conclusions: PDX screening demonstrated significantly higher yield in detecting both DSTB and MDR-TB among close contacts of MDR-TB patients, with a 61.5% and 150% increase in case detection, respectively, compared to symptomatic screening. These findings support the integration of PDX into contact investigation strategies to enhance early diagnosis and interrupt transmission in high-burden settings.

EP01-708-18 Designing a digital clinical decision support system to strengthen implementation of treatment decision algorithms for childhood TB in Zambia and Mozambique

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Background and challenges to implementation: Digital tools such as clinical decision support systems (CDSS) could support the use of Treatment decision algorithms (TDAs) for childhood tuberculosis by healthcare workers. There is no data on design and implementation of a CDSS specifically tailored for TDA use in low- and middle-income countries (LMICs), where local workflows, infrastructure limitations, and integration with national health systems present unique challenges.
Intervention or response: As part of the Decide-TB project, a digital CDSS embedded within an electronic medical record (EMR) was co-designed by national TB programs (NTPs) in Zambia and Mozambique and research partners.
Researchers and NTP representatives identified essential data variables, and selected the system based on existing healthcare infrastructure. Iterative usability testing in real-world settings with healthcare workers—using the System Usability Scale and Think-Aloud protocols—helped assess the usability and shape key refinements.
Results/Impact: The tool included a 19 structured program stages EMR in DHIS2 Tracker with automated algorithm scoring, and built-in program rules to guide clinical decisions. It was deployed on tablets with offline functionality to support continuity in low-connectivity setting. Implementation was supported by structured training and real-time dashboards for supervision.
Usability testing and feedback from healthcare workers revealed that factors such as variability in digital literacy, limited access to devices, and non-intuitive design features of the DHIS2 platform influenced tool usability.
Adaptive support mechanisms, including continuous peer learning and WhatsApp-based data entry support, enhanced adoption and consistent use of the CDSS.

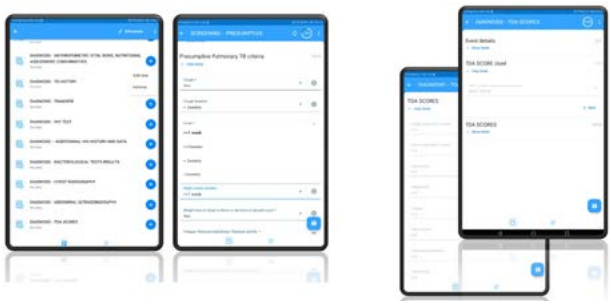

Figure. Illustrative screenshots: EMR/CDSS interfaces.

Conclusions: Developing digital CDSS tools to support TDA implementation in LMICs requires more than technological innovation; it demands stakeholder co-design, adaptation taking into consideration structural barriers such as electricity issues or internet issues and embedded capacity-building strategies adapted to the digital literacy of HCWs.

Addressing these factors holistically is crucial for digital CDSS tools to effectively enhance TDA uptake in LMICs.

EP01-709-18 Improving TB treatment outcomes through an interactive voice-based mobile health tool: Evaluation of the Call for Life tool in Karamoja, Uganda

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Background and challenges to implementation: The Call for Life (C4L) tool an interactive voice-based mobile health intervention providing daily treatment reminders, appointment alerts, and health tips via basic phones has been documented to improve TB and HIV outcomes in urban Uganda. The Karamoja, a remote region in northeastern Uganda, is home to nomadic pastoralist communities with limited access to healthcare, high mobility, and low literacy.

In 2020, the region's TB treatment success rate was only 48%, far below the national target of 85%. To address this, the USAID PACT-Karamoja Activity introduced the Call for Life (C4L) tool at five high volume health facilities to improve TB treatment outcomes. We evaluated the impact of this tool in this challenging setting.

Intervention or response: We conducted a retrospective cohort study in 13 health facilities in Karamoja. Five sites implemented the C4L tool; eight comparable sites served as controls. Patients were identified from the C4L database and TB clinic registers using systematic sampling.

The primary outcome was treatment completion. We used multivariable logistic regression with inverse probability weighting to adjust for confounders.

Results/Impact: We included 1,202 patients with drug-susceptible TB (601 users and 593 non-users) treated between September 2020 and August 2022. The majority (59.5%) were male. Median age was 38 years (IQR: 29–52); 64% had bacteriological confirmation, and 87.5% were HIV negative. C4L users had significantly higher treatment completion rates (92.2%) compared to non-users (83.8%), an 8.4 percentage point difference (95% CI: 4.71–12.02, $p<0.001$). Loss to follow-up was lower among users (1.3% vs. 8.8%). A higher proportion of C4L users had a documented sputum smear result at six months (97.0% vs. 76.0%, $p<0.001$).

Characteristic	Total N(Col%)	Arm		p-value
		Intervention n(Col%)	Control n(Col%)	
Overall	***1,194***	***601(50.3%)***	***593(49.7%)***	
Sex				
Male	711 (59.5)	386 (64.2)	325 (54.8)	
Female	483 (40.5)	215 (35.8)	268 (45.2)	<0.001[c]
Age in completed years (Median (IQR))	38 (29, 52)	37 (28, 52)	39 (30, 52)	0.222[w]
Weight in Kg (Median (IQR)) (N=1071) *	50 (45, 56)	50 (45, 56)	50 (45, 56)	0.788[w]
Height in cm (Median (IQR)) (N=767) *	170 (164, 175)	170 (165, 176)	170 (162, 175)	0.122[w]
BMI (N=765) *	17.51 (15.73, 19.15)	17.63 (15.73, 19.22)	17.24 (15.73, 19.08)	0.233[w]
Disease classification (TB diagnosis type) (N=1193) *				
Bacteriologically confirmed PTB (P-BC)	763 (64.0)	373 (62.1)	390 (65.9)	
Clinically Diagnosed PTB (P-CD)	299 (25.1)	132 (22.0)	167 (28.2)	
Extra-Pulmonary TB (EP)	131 (11.0)	96 (16.0)	35 (5.9)	<0.001[c]
Type of Patient				
New	1,104 (92.5)	566 (94.2)	538 (90.7)	
Previously treated	90(7.5)	35(5.8)	55(9.3)	0.024[c]
Place of Diagnosis (N=1192) *				
Facility	851 (71.4)	540 (89.9)	311 (52.6)	
Community	341 (28.6)	61 (10.1)	280 (47.4)	<0.001[c]
Patient transferred Out (N=1191) *				
Yes	293 (24.6)	217 (36.2)	76 (12.9)	
No	900 (75.4)	382 (63.8)	515 (87.1)	<0.001[c]
If transferred, where? (N=293)				
Within district	128 (43.7)	84 (38.7)	44 (57.9)	
Outside the district	165 (56.3)	133 (61.3)	32 (42.1)	0.004[c]
HIV Result (N=1188) *				
Positive (CT1)	127 (10.7)	63 (10.6)	64 (10.8)	
Negative (CT2)	1,040 (87.5)	521 (87.3)	519 (87.8)	
Unknown/Undocumented	21 (1.8)	13 (2.2)	8 (1.4)	0.557[c]
ART Status (N=126)				
Yes	91 (72.2)	45 (73.8)	46 (70.8)	
No	1 (0.8)	0 (0.0)	1 (1.5)	
Unknown	34 (27.0)	16 (26.2)	18 (27.7)	0.919[f]
Health facility Level				
Health Center III's	375 (31.4)	129 (21.5)	246 (41.5)	
Health Center IV's	58 (4.9)	0 (0.0)	58 (9.8)	<0.001[f]
Hospitals	761 (63.7)	472 (78.5)	289 (48.7)	

Table. Baseline characteristics at TB diagnosis.

Characteristic	Total N(Col%)	Arm		Difference (percentage points) (95% CI)
		Intervention n(Col%)	Control n(Col%)	
Overall	***1,194***	***601(50.3%)***	***593(49.7%)***	
Treatment outcome				
Favorable outcome	*1,051(88.0)*	*554(92.2)*	*497(83.8)*	*8.4(4.71 to 12.02)*
Unfavorable outcome	*143(12.0)*	*47(7.8)*	*96(16.2)*	*-8.4(-12.02 to -4.71)*
		p-value <0.001[c]		
Treatment outcome categories				
Completed Treatment	1,051(88.0)	554(92.2)	497(83.8)	8.4(4.71 to 12.02)
Died	65(5.4)	34(5.7)	31(5.2)	0.5(-2.14 to 3.00)
Failed	18(1.5)	5(0.8)	13(2.2)	-1.4(-2.74 to 0.02)
Lost to Follow-up	60(5.0)	8(1.3)	52(8.8)	-7.5(-9.89 to -4.98)
		p-value<0.001[f]		
Treatment outcomes for participants with a documented phone number (N= 728*)	***728***	***601***	***127***	
Favorable outcomes	663(91.1)	554(92.2)	109(85.8)	6.4(-0.42 to 12.47)
Unfavorable outcomes	65(8.9)	47(7.8)	18(14.2)	-6.4(-12.79 to 0.00)
		P=0.023[c]		

Table. Treatment outcomes in the different study arms.

Conclusions: The C4L tool significantly improved TB treatment outcomes in a remote, high-burden setting.

EP02 Diagnostic networks in TB: Optimisation through innovation

EP02-710-18 A catalytic approach to strengthening laboratory systems through innovative solutions in technical assistance, training and capacity building: Case study of the Uganda Supranational Reference Laboratory

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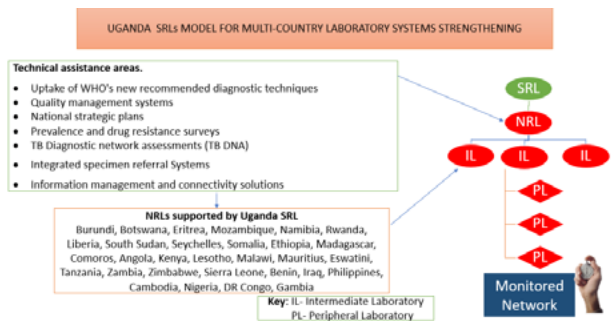
Background and challenges to implementation: Although tuberculosis is preventable and curable, it remains the leading global cause of mortality of a single infectious agent. The World Health Assembly endorsed the END TB strategy, but countries are far behind in achieving these goals. The glaring gaps require robust and coordinated innovative approaches to tackle the strategy's technical and programmatic needs. The Uganda National TB Reference Laboratory (NTRL) acquired the WHO Supranational Reference Laboratory (SRL) status in 2013 with a mandate to support laboratory networks across sub-Saharan Africa.
Intervention or response: Since 2013, the Uganda SRL expanded its highly skilled workforce coupled with facility infrastructure developments and the acquisition of advanced equipment. The NRLs in the region were supported through targeted technical assistance and mentorship. Developed an adult learning training program and a proficiency testing (PT) scheme. A laboratory information management system (LIMS) for TB laboratories and an integrated network connectivity solution were developed and availed in three languages. SRL personnel participated in Diagnostic network assessments for 5 Countries.



Results/Impact: Thirty highly qualified and competent SRL consultants are certified to offer technical assistance. An equipped state-of-the-art (BSL3) laboratory exists. Twelve countries can provide quality-assured TB Drug susceptibility testing. Three international accreditations were acquired (ISO15189, ISO17043 for 16 scopes, and ANSI/IACET for continual education and training with 23 courses). Sixteen countries were supported to develop and implement national strategic plans. Accreditation of fourteen NTRLs to ISO 15189 as well as PT provision to 25 countries. A web-based online system was developed to manage PT data. The TB LIMS and connectivity solutions were adopted by seven and two countries respectively.
Conclusions: The unique support model employed by the Uganda SRL has proved to be effective and relevant to achieve the END TB strategy objectives. The model can therefore be adopted for national laboratory networks, multi-country support projects as well as laboratory systems strengthening initiatives.

EP02-711-18 Moving from microscopy to nucleic acid amplification test: Leveraging diagnostic network optimisation to address challenges and strengthen TB testing in Jalandhar, India

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Background and challenges to implementation: Jalandhar district in Punjab possesses promising potential to enhance its TB testing capacity by leveraging advanced diagnostic technologies. However, current challenges contribute to underutilization and a continued emphasis on microscopy over NAAT (Nucleic Acid Amplification Tests), with limitations related to human resources, sample transport, and workflow integration.
This study aims to assess the impact of the Diagnostic Network Optimization (DNO) initiative, which seeks to facilitate a smooth transition from microscopy services to NAAT and optimize the utilization of TB diagnostic resources in Jalandhar.
Intervention or response: Using 2024 as the baseline, data from Nikshay (India's web-based TB surveillance data system) was analysed across all diagnostic centres in the district. Key gaps identified were over-reliance on microscopy, low NAAT use (33.1% of capacity), suboptimal technical knowledge of the staff, and weak sample transport at several sites. To address these gaps, data-driven strategies were implemented from January–March 2025, including (i) upfront NAAT at microscopy-linked sites

(reserving microscopy for follow-up), (ii) staff reallocation to high-volume centres, (iii) NAAT machine relocation to high-demand sites, and (iv) streamlined sample transport via community health workers.
Post-intervention data (January to March 2025) was analysed using SPSS version 22. Parameters included (a) testing volumes, (b) NAAT utilization, and (c) Universal Drug Susceptibility Testing.
Results/Impact:

Indicator	2024 (Baseline)	January–March 2025	% Change
NAAT utilization against capacity	33.1%	94.3%	+61.2%
Average Monthly NAAT tests	505	1,610	+219%
Average monthly microscopy tests	101	80	−21%
Microscopy as follow-up	13%	16%	+3%
Universal drug susceptibility testing coverage	61%	73%	+12%

Table 1- Comparative data showing impact of DNO.

Conclusions: DNO exercise revealed critical gaps in TB care cascade, including underuse of molecular diagnostics, inefficiently used human resources, and weak sample transport. As NAAT adoption expands, institutionalizing data-driven DNO is extremely vital for adaptive, evidence-based planning to ensure equitable TB diagnosis.

EP02-712-18 Early lessons of - TB diagnostic network optimisation- to accelerate TB diagnosis in India

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Background and challenges to implementation: Early and accurate diagnosis of TB is essential for achieving the global END TB targets. India contributes to one-fourth of global TB cases (~2.55 million). Though the country has prioritized molecular WHO-recommended rapid diagnostic (mWRD) tests for TB diagnosis, missing TB cases is still a concern. FIND is implementing 'TB Diagnostic network optimization' (DNO) initiative in India from 2024, supported by the Gates Foundation; in collaboration with National TB elimination programme (NTEP). We document the early findings of this initiative.
Intervention or response: FIND's TB DNO initiative is being implemented in all districts of Bihar and Maharashtra states of India, focusing on strengthening the TB diagnostic landscape. Under the project, geospatial analysis of TB diagnostic networks (including sample referral and transportation) is carried out and optimized networks are developed using routine NTEP data. Technical assistance (on-site assessment, training of laboratory personnel) is offered to facilities with mWRD devices. To determine the effect of DNO initiative on TB diagnostic tests, 30 districts were selected (based on TB notification; 18 from Bihar and 12 from Maharashtra). The mWRD test device performances (coverage, utilization) of years 2023 and 2024 were compared.
Results/Impact: In 2024, the mWRD devices per 100,000 population increased by ~133% (0.206 vs 0.480) compared to 2023. The mWRD tests increased by 97% (185,018 in year 2023 vs 364,926 in year 2024) and mWRD utilization improved by 45% from 2023 (29%) to 2024 (42%) (Figure 1). The optimized TB diagnostic models suggest a decrease in average distance and time between sample collection sites and mWRD facilities, once DNO suggestions are operationalized.

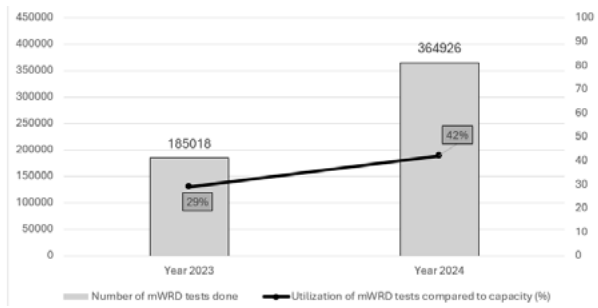

Figure 1. Utilization of molecular WHO-recommended rapid diagnostic tests under FIND'S DNO project, India, 2024

Conclusions: The TB DNO initiative shows promising insights for improving the TB diagnostic landscape of the country. Scaling up similar geospatial initiatives will help the country in meeting the END TB targets.

EP02-713-18 Optimising TB diagnostics: Evaluating the screening capacity and cost benefits of sputum pooling in PHC Masaka, Nasarawa State, Nigeria

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Background: Tuberculosis (TB) remains a critical global health issue, particularly in resource-limited settings. While highly accurate, molecular diagnostic tools like Xpert MTB/RIF and Xpert MTB/RIF Ultra are costly, with cartridges priced at $7.97–$9.98. These expenses hinder large-scale testing, especially in low-income countries such as Nigeria, which faces one of the world's highest TB burdens. Limited resources significantly constrain diagnostic efforts, leaving many individuals unscreened. Sputum pooling offers a promising solution by allowing multiple sputum samples to be tested with a single cartridge, cutting costs and expanding diagnostic capacity.
This study evaluates and compares the screening capacity and cost-effectiveness of sputum pooling versus individual testing to optimize TB diagnostics.
Design/Methods: A cross-sectional study was conducted at PHC Masaka involving 523 presumptive TB individuals aged 15 years and above. Each participant provided two sputum samples, one for individual testing and pooling with Xpert Ultra, and the other for MGIT culture. Pools were formed with four samples per pool. Pools were formed with four samples per pool. Data was analyzed using STATA v15.1 to evaluate diagnostic efficiency, including the number of samples tested, cartridges used, MTB-positive cases detected, and cost savings.

Metric	Individual Testing	Pool Testing	Savings/ Additional
Samples Tested	503	131	1,516 additional Presumptives
MTB/RIF Ultra Cartridges Used	511 (including 3 repeats)	132 (including 1 repeat)	379 saved cartridges
MTB-Positive Cases Detected	33	26	
Increase in TB Presumptives Tested	N/A	N/A	201.4%
Cost of Saved Cartridges (379)	N/A	N/A	$3,020.63 (379 × $7.97 per cartridge)

Table 1: Impact of Pooling on TB Diagnostic Cost Savings, and Efficiency

Results: Result of 503 individual samples and 131 pooled samples were analyzed yielding 33 MTB-positives from individual testing and 26 MTB-positives from pool. Sputum pooling saved 379 cartridges, that can enable screening of 1,516 additional TB Presumptives—an increase of 201.4% in screening capacity. At $7.97 per cartridge, these savings amounted to $3,020.63.
Conclusions: Sputum pooling demonstrates substantial efficiency and economic benefits for optimizing TB diagnostics. This method expanded diagnostic capacity while achieving cost savings, supporting its feasibility in resource-limited settings. Careful implementation is necessary to address State/Regional TB prevalence and ensure adequate follow-up testing.

EP02-714-18 Diagnostic network optimisation: Increasing access and utilisation of molecular WHO recommended rapid diagnostics (mWRD) for TB Elimination in Uttar Pradesh, India

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Background and challenges to implementation: India contributes 26% of the global TB burden and Uttar Pradesh (UP) 20% of India's notified TB. Since 2021, the state of UP has substantially enhanced TB Case Notification. The utilization of molecular WHO recommended rapid diagnostics (mWRD) for confirmation of active TB disease was sub-optimal remained suboptimal.
Intervention or response: In 2024, India Health Action Trust (IHAT) working under the leadership of State TB Program initiated implementation of the Gates Foundation Diagnostic Network optimization (DNO) project.
The objective is to increase the coverage of mWRD among individuals with TB disease to 85%. IHAT mapped the mWRD machines by number, types functional modules, geolocation, capacity for testing, availability of human resource.
Evidence generated was shared with the state for actions including filling HR vacancies, ensuring equitable distribution of machines, test kits timely maintenance of devices/supportive equipment, and enhanced linkages with primary healthcare sites.
Results/Impact: The mWRD machines performing TB tests increased from 80% (725/898 in 2023) to 95% (882/926 in 2024). Population accessibility analyses determined that 77% had access to mWRD within 30 minutes driving distance. District average performance of tests increased from 47% (0.75M) to 74% (1.32M) of estimated annual capacity (1.8M). Equipment breakdown resolution within a week from 60% to 89%. Because

notification of TB cases increased from 6.2 M (2023) to 6.8 M (2024), the proportion of active TB diagnosed using bacteriological confirmation remained stable (40%) (274045/682092).

However, the proportion of bacteriological confirmation from mWRD vs smear improved from 31% (83598/253843) in 2023 to 48% (130640/274045) in 2024. Offer of mWRD among diagnosed increased from 54% (2023) to 60% (2024). Upfront of mWRD testing among presumptive TB increased from 17% (2023) to 26%(2024).

Year	Notification	Bacteriological Confirmation	Percentage	NAAT Testing among Bacteriological Confirmation	Percentage	Smear Testing among Bacteriological Confirmation	Percentage
2023	622950	253843	41%	83598	33%	116078	46%
2024	682092	274045	40%	130640	48%	82392	30%

NAAT Offered Among Notified TB cases

Year	Notification	Offered NAAT	Percentage
2023	622950	344763	54%
2024	682092	413874	60%

Table. Notification Bacteriological Confirmation (NAAT and Smear Testing) Data Source: Ni-KSHAY

Conclusions: UP's progress with expanding, utilization of mWRD diagnostics is significant but requires acceleration to achieve the national target of 85% of diagnosed TB offered an mWRD test.

EP02-715-18 Enhancing molecular testing for TB detection through diagnostic network optimisation: Implementation insight from the 100 days TB Campaign in Uttar Pradesh, India

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Background and challenges to implementation: The Government of India launched a 100-day intensified TB campaign from December 2024 to March 2025 under the National Tuberculosis Elimination Programme (NTEP). This campaign aims to improve case detection, enhance TB prevention, and reduce mortality. In Uttar Pradesh, the state with the highest TB notifications, a diagnostic network optimization (DNO) exercise was implemented to boost molecular testing for TB detection. The study aims to assess the impact of this DNO exercise on increasing the number of molecular tests and daily utilization of Nucleic Acid Amplification Test (NAAT) services.

Intervention or response: TB detection centres with NAAT facilities were categorized based on daily utilisation capacity vis-à-vis workload. (i) High workload-low utilization, (ii) Low workload-low utilisation, (iii) High workload-high utilisation facilities. To optimize diagnostic operations, a multi-pronged strategy was conceptualised. Laboratory technicians were deployed from low workload to high workload centers, thereby extending NAAT operations from 8 hours to 16 hours. The study compared data of same period from last year (Jan–Feb 2024) with campaign-period data (Jan–Feb 2025) of this year. Data was sourced from Nikshay, India's web-based TB surveillance system. Key parameters included (i) number of NAAT tests conducted, (ii) machine utilisation rates, and (iii) TB notifications.

Results/Impact: The intervention led to a significant improvement in NAAT machine utilisation and testing output along with an increase in TB case notifications in the comparable study period (Figure 1). Statistical analysis using SPSS ver 22 also confirmed the association between network optimisation (increased NAAT testing) and increased TB notification ($p < 0.05$).

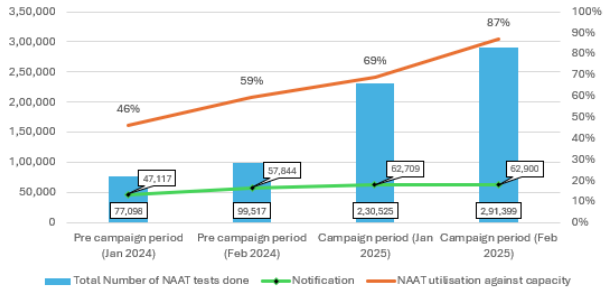

Figure 1. NAAT testing and utilization - Pre campaign & during campaign in Uttar Pradesh.

Conclusions: Diagnostic Network Optimization has significantly enhanced the molecular testing capacity and utilization rates in Uttar Pradesh. This scalable strategy is a replicable model for resource-limited high-burden states, contributing effectively to India's goals for tuberculosis elimination.

EP02-716-18 Impact of diagnostic network optimisation on TB diagnostic capacity and detection in high-burden setting: A comparative study from Delhi, India

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Background and challenges to implementation: Delhi, with tuberculosis (TB) prevalence rate of 747 cases per 100,000 population, is implementing upfront Nucleic Acid Amplification Test (NAAT) within framework of national TB program. However, progress is often impeded by suboptimal utilization of existing diagnostic infrastructure.
A Diagnostic Network Optimization (DNO) exercise was conducted during India's 100-day intensified TB case-finding campaign, aimed to evaluate and enhance utilization of NAAT infrastructure.
The study aims to conduct a comparative assessment of impact of DNO on utilization of existing NAAT capacity and detection of TB during two distinct periods: the pre-campaign phase (December 7, 2023, to March 24, 2024), and campaign phase (December 7, 2024, to March 24, 2025), without any capacity expansion.

Intervention or response: A state-wide assessment indicated that total of 1,266 NAAT could be conducted daily under full operational capacity.
This finding informed planning and implementation strategies, with interventions like
i. Redistribution of sputum samples as per optimal testing capacity,
ii. Improved availability of testing cartridges, and;
iii. Reassignment of laboratory technicians for additional work shifts.
These measures were designed to reduce testing backlog and maximize diagnostic yield within brief timeframe. A retrospective comparison was conducted utilizing data extracted from laboratory reports and Ni-kshay (India's digital TB surveillance system) and analyzed using SPSS ver22.
Results/Impact: During study period, NAAT utilisation increased from 25,801 tests to 66,462 tests (158%) and total TB diagnosed increased from 6,777 to 11,832 (75%). A two-proportion Z-test showed increase in proportion of TB cases diagnosed was statistically significant ($z = 28.76$, $p < 0.001$), indicating true improvement in case detection rather than random variation.
Conclusions: Delhi's proactive and targeted optimization of NAAT diagnostic capacity enabled significant increase in TB case-detection during 100-day intensified TB case-finding campaign. This model of leveraging existing diagnostic infrastructure through data-driven planning offers replicable approach for other high-burden urban settings in resource-limited scenarios.

EP02-717-18 A pilot study on external quality assessment using dried tube spot samples on the Truenat platform in Nigeria: Results and lessons learnt

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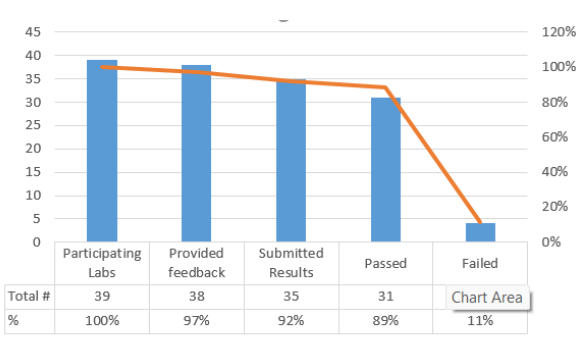
Background and challenges to implementation: External Quality Assessment (EQA) is critical for ensuring the accuracy and reliability of diagnostic testing, particularly in decentralized settings. This pilot study aimed to evaluate the feasibility and performance of using Dried Tube Spot (DTS) samples for EQA in sites utilizing the Truenat platform for molecular diagnostics in Nigeria.
Intervention or response: A total of 39 sites participated in the pilot EQA program in March 2024(Q1). DTS panels were distributed to all sites, and participants were required to analyze the samples using the TrueNat system and submit their results. Performance indicators, including participation rate, result submission, pass/fail rates, and reported challenges, were assessed to determine the effectiveness of the approach.
Results/Impact: Out of 39 participating sites, 38 (97.4%) provided feedback, and 35 (92%) successfully submitted their results. Among those, 31 sites (89%) achieved a passing score, while 4 sites (11.4%) did not meet the required performance standards. Additionally, 3 sites (8%) reported challenges without submitting complete results, and 1 site (3%) did not provide any feedback. Importantly, all sites received their DTS panels, and no sites were excluded from the evaluation.



Conclusions: This pilot study demonstrates that DTS-based EQA is a feasible and effective approach for performance monitoring of TrueNat-based molecular diagnostics in Nigeria. The high participation and result submission rates indicate strong engagement, while the observed failure rates highlight the need for continued training and support. Scaling up DTS-based EQA could enhance quality assurance in molecular testing programs, contributing to improved disease diagnosis and surveillance.

EP02-718-18 Optimal utilisation of NAAT devices by strengthening population accessibility between NAAT labs and peripheral health centrers in Maharashtra, India

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Background and challenges to implementation: Nucleic Acid Amplification Test (NAAT) devices have revolutionized the diagnosis of tuberculosis (TB) and other respiratory infections by offering rapid and accurate detection. However, their optimal utilization remains a challenge, particularly in resource-limited settings like India where population accessibility is constrained. This study aims to enhance the NAAT device utilization by strengthening population accessibility between NAAT labs and peripheral health centers (PHC). We utilize the Diagnostic network optimization (DNO) model that maximizes device throughput while minimizing patient turnaround time (TAT) in Maharashtra state.

S#	Parameters	MH Baseline model (Year 2023) - DMC to NAAT	MH Baseline (Year 2024) - DMC to NAAT	% Change in Baseline (2023 Vs 2024)
1	NAAT utilization Vs capacity (%)	NAAT Test - 4,94,329 Testing Capacity - 14,34,600 Utilization - 34.46 %	NAAT Test - 9,85,446 Testing Capacity - 21,58,200 Utilization - 45.66 %	NAAT test increased = 99.35% Testing Capacity increased= 50.4% Utilization increased = 32.5%
2	Average service distance (ASD) from PHC/SC to NAAT site	22.61 Km	12.57 Km	44.41%
3	Average time for sample transportation from PHC/SC to NAAT site (in minutes)	33.92 Min	18.86 Min	44.4%
4	Average sample transportation cost from PHC/SC to NAAT site	21,919.92 (INR)	16,857.51 (INR)	23.1%

Table.

Intervention or response: A geospatial analysis was conducted using software tools like Dxgeomap and ArcGIS with feeding in the data of TB prevalence taken from State TB cell and healthcare facility locations in all districts (36) of Maharashtra. Mapping was conducted based on 30-minute driving time to the nearby TB testing facility in the district.

Diagnostic network Labs were also assessed by conducting in person visits to DMC sites and linked NAAT labs, using predefined checklist based on evaluating the on-ground situation of sample transportation time, testing capacity, and result reporting turnaround.

Results/Impact: Baseline data analysis from year 2023 and 2024 (Table 1) indicate that implementing DNO approaches can reduce sample transportation delays from DMC to NAAT labs by up to 44.4%, improving timely diagnosis and initiation of treatment. Saturating NAAT devices in the state and linking the peripheral health centres to optimized hubs showing a 99.35% increase in NAAT tests, ensuring better utilization of NAAT devices and resulted in reduction of average service distance (ASD) by 44.41%.

Additionally, sample transportation cost was significantly reduced by 23.10%, facilitating affordable TB/DRTB management.

Conclusions: This DNO model enhances device utilization, reduces diagnostic delays, and improves early TB/DRTB detection. Future scalability of this approach requires integrated healthcare network, policy support, digital tracking systems, and investment in sample transport networks for efficient NTEP service delivery.

EP03 Childhood TB: Prevention and treatment for drug-susceptible and resistant TB

EP03-719-18 Optimising child-friendly TB prevention regimens: Qualitative insights from Ethiopian interest-holders

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Background: The World Health Organization recommends short rifamycin-based tuberculosis preventive treatment (TPT) regimens in children. Attributes determining regimen acceptability remain poorly understood. We explored perceptions towards 3HP and 3RH among key informants recently engaged with TB prevention services in Ethiopia.

Design/Methods: Forty-seven in-depth interviews were conducted with caregivers of TB-exposed children, community health workers (CHWs), healthcare providers, and policy makers after the completion of the CHIP-TB trial, a programmatic, cluster-randomized trial designed to evaluate home-based TPT services delivered by CHWs.

We used thematic content analysis, using both a deductive and inductive approach, assessing acceptability based on palatability, ease of ingestion, dosing frequency, pill burden, adherence, side effects, and tolerability.

Results: Caregivers reported good palatability for both 3RH and 3HP, although some caregivers mentioned that their children vomited or wanted to spit out the medication. Dosing frequency was a crucial factor influencing acceptability, eliciting mixed responses—while all stakeholder groups acknowledged that weekly doses were easier to forget, targeted messaging and implementation strategies were employed to support adherence.

Conversely, 3RH daily dosing was considered burdensome and caregivers expressed difficulties forcing their children to take medication every day. Policy makers and providers demonstrated greater acceptance and preference for prescribing 3HP over 3RH, however, the higher number of loose pills per dose in the 3HP regimen was cited as a disadvantage, and the need for a fixed-dose,

child-friendly formulation was raised. Across both regimens, interest-holders reported generally mild side effects that did not result in treatment discontinuation.
Conclusions: While interest-holders generally preferred the 3HP regimen over 3RH for children due to its reduced dosing burden, they also highlighted the challenge posed by the higher number of pills per dose. Incorporating the preferences of children and their caregivers will be essential in developing child-friendly formulations that support better uptake, adherence, and improved treatment outcomes.

EP03-720-18 Effectiveness of strengthening frontline workers in enhancing TPT uptake among child contacts

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Background and challenges to implementation: The prescription and TPT uptake among child TB contacts (0–14 years) remains low, with declining trends over time. Supportive supervision revealed major gaps in contact tracers' capacity for identifying and managing eligible children. Strengthening frontline workers is crucial to improve timely TPT initiation and reduce TB incidence in this vulnerable group.
Intervention or response: In four Southwestern states of Nigeria, contact tracers under the Institute of Human Virology Nigeria (IHVN) were trained on effective counselling techniques, as well as the identification and mobilization of eligible child contacts (ages 0–14) for Tuberculosis Preventive Therapy (TPT). These trained personnel operate across designated public and private health facilities in 93 Local Government Areas (LGAs).
This capacity-building intervention was assessed by comparing TPT uptake among child contacts during two identical 12-month periods: October 2022–September 2023 (pre-training) and October 2023–September 2024 (post-training).
The study aimed to measure the impact of the training on TPT initiation rates in both public and private health sectors. Routine monitoring assessed the impact of training on TPT uptake indicators.
Results/Impact: Following the training intervention, TPT uptake among eligible child contacts (ages 0–14) showed a significant improvement. In private health facilities, enrolment increased from 28% in September 2023 to 61% in September 2024. Similarly, in public facilities, uptake more than doubled, rising from 25% to 56% over similar period.

CHILDREN CONTACT TPT UPTAKE 2023					CHILDREN CONTACT TPT UPTAKE 2024				
Age	0-4 yrs		5-14yrs			0-4 yrs		5-14yrs	
Facility type	CI-Private	CI-Public	CI-Private	CI-Public	Facility type	CI-Private	CI-Public	CI-Private	CI-Public
# of contacts eligible for TPT	581	2534	1770	9082	# of contacts eligible for TPT	720	3546	2131	11127
Facility type	CI-Private	CI-Public	CI-Private	CI-Public	Facility type	CI-Private	CI-Public	CI-Private	CI-Public
Total enrolled on TPT	240	105	419	2817	Total enrolled on TPT	474	2067	1252	6190
%	41%	4%	24%	31%	% improvement	66%	58%	59%	56%

Conclusions: Strengthening the capacity of the contact tracers significantly improved and increased TPT uptake in eligible children 0 - 14 years identified in the private and public health facilities. The observed increase in TPT uptake underscores the effectiveness of capacity-building interventions in enhancing pediatric TB prevention outcomes. These findings suggest that strengthening the skills of frontline health workers can substantially improve TPT coverage and contribute to more effective TB control in child contacts.

EP03-721-18 Closing the gaps in TB preventive therapy for under-6 child contacts in Enugu State, Nigeria: A 4-year review

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Background: Tuberculosis Preventive Therapy (TPT) is critical in reducing the risk of progression from latent TB infection to active TB disease, especially among high-risk groups like under-6 child contacts of TB cases. Despite its importance, TPT implementation in Nigeria remains suboptimal. This study assesses the 4-year trend (2015–2018) of TPT provision for under-6 child contacts in secondary and primary TB health facilities in Enugu State, Nigeria. The state has an estimated 5,383,817 population and 5 % case findings for children.
Design/Methods: A retrospective desk review of routine TB program data was conducted. Data were analysed using Microsoft Excel to derive counts, means, and proportions. The TB contact investigation cascade — 770 from identification to initiation of TPT—443 was evaluated.

Results: During the study period, 5,200 bacteriologically confirmed index TB cases were notified. A total of 770 under-6 child contacts were identified (an average of 0.1 child per index case), of which 660 were screened. Of those screened, 574 were eligible for TPT, and 443 were initiated on TPT. However, 327 children (13%) were lost across the cascade, from identification to TPT commencement—averaging 82 annually.
Additionally, 196 children (10%) were either not screened or found ineligible for TPT. Only 59 TB cases were notified in the 0–4 age group during the period. A steady increase in TPT coverage was observed from 2015 to 2018, with the highest number of contacts (268) identified and 131 initiated on TPT in 2018.
Conclusions: There is significant attrition of under-6 child contacts across the TPT cascade in Enugu State. Strengthening TB contact tracing, provider sensitization, mandatory and free chest X-rays for children, and integrating child TB indicators into routine reporting are essential. Improved tracking and caregiver engagement are critical to achieving global TB prevention goals.

EP03-722-18 Paediatric drug-resistant TB prevention in resource-limited settings: Mozambique's experience with levofloxacin prophylaxis

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Background and challenges to implementation: Children exposed to multi-drug-resistant tuberculosis (MDR-TB) face high risks of disease progression. In 2021, Mozambique introduced a six-month levofloxacin-based TB preventive therapy (TPT). This operational evaluation analyses the programmatic cascade and treatment outcomes to inform TB elimination efforts.
Intervention or response: We conducted a national retrospective analysis of children (0–14) treated for MDR-TB infection from 2022–2024. Data from patient records, national TB registers, and monthly aggregated reports were analysed in Stata 18.0, covering the TPT cascade and outcomes. Eligibility followed National TB Program guidelines.
Results/Impact: During the period, 4,679 MDR-TB index cases were reported in Mozambique, with 1,437 child contacts (0–14 years) identified and 1,386 (96.4%) screened. Of these, 907 (65.4%) were eligible and initiated on Levofloxacin-based TPT, with annual uptake increasing from 63 (2022) to 443 (2023) and 401 (2024). Poisson regression confirmed a significant upward trend ($p < 0.0001$), with an estimated 81% annual increase. The cohort had a mean age of 7.2 years (SD ±3.9), 41.6% were female (n=377), and HIV co-infection was rare (0.2%, n=2), both cases on ART. Among the 907, 684 (75.4%) completed treatment, 148 (16.3%) were still on treatment, 53 (5.8%) lost to follow-up, 8 (0.9%) active TB, and 2 (<0.5%) died.
Limitations: Data quality was limited by inconsistent records and a 23.8% discrepancy between sources, potentially impacting cascade accuracy. Contextual factors (e.g., socioeconomic status, access barriers, adherence, or adverse events) that may influence outcomes, were not assessed. The retrospective design limited causal inference and implementation insights.

Total child contacts (0-14yrs) / MDR-TB index cases	**1,437 / 4,679**	
Total child contacts screened	1,386	96.4%
Total child contacts eligible for TPT	907	65.4%
Total child contacts initiated on TPT	907	100%
TPT Outcomes: Completed TPT	684	75.4%
Still on treatment	148	16.3%
Lost to follow-up	53	5.8%
Developed active TB	8	0.9%
Death	2	0.22%
Not evaluated	12	1.3%

Table 1: Levofloxacin-based TPT cascade, 2022-2024.

Conclusions: Mozambique's levofloxacin-based TPT program achieved high screening coverage (96.4%) and met WHO completion targets (>75%), showing feasibility in routine care. However, a 65.4% initiation rate (vs. WHO ≥90%) reveals gaps. Strengthening digital reporting, decentralising TPT to community-based level, and addressing knowledge gaps can reduce loss to follow-up and improve initiation.

EP03-724-18 Revolutionising childhood TB treatment: Programmatic implementation and rollout of the four-month shorter treatment regimen for drug-susceptible childhood TB in Zambia

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Background and challenges to implementation: Childhood tuberculosis (TB) has traditionally been treated using a six-month regimen, often associated with adherence challenges. In 2022, the WHO recommended a four-month Shorter Treatment Regimen (STR) for children with non-severe drug-susceptible TB (DS-TB). Zambia adopted the STR into its National Consolidated TB Guidelines to improve treatment outcomes.
Intervention or response: Zambia began a phased rollout of the STR in 2023, using an implementation framework that included training, mentorship, and data tools. The pilot covered Lusaka and Copperbelt provinces, involving 4 tertiary hospitals, 8 first-level hospitals, and 14 primary health centers. Nationwide rollout began in 2024, supported by hybrid training and mentorship. Data were collected through routine reports, facility surveys, and healthcare worker (HCW) interviews. Key indicators included treatment initiation, regimen adherence, adverse events, and HCW readiness.
Results/Impact: Between May 2023 and December 2024, over 2,000 HCWs were trained across 90 of 116 districts. In 2023, 26 pilot facilities reported 528 childhood TB cases, with 109 non-severe cases, of which 91% were initiated on STR. By June 2024, cumulative cases for 2024 rose to 706, with 71% of eligible non-severe cases started on STR. Following national rollout in mid-2024, 375 additional cases were diagnosed, with 75% of eligible children initiated on STR. By the end of 2024, 1,987 cases were reported, with 84% of non-severe cases receiving STR. HCWs demonstrated competence in differentiating non-severe from severe TB, contributing to high STR initiation rates. Challenges included training gaps, limited caregiver awareness, low HCWs confidence levels and inadequate Chest x-ray interpretation skills. Facilities with strong TB management systems integrated STR better.
Conclusions: Zambia's implementation of STR has proven feasible, acceptable, and sustainable. Key to its success are the integration into national guidelines, continuous mentorship, and a strong TB management system. The STR offers an opportunity for scaling TB treatment improvements in low- and middle-income countries (LMICs).

EP03-725-18 Urine biomarker assessment of adherence to TB treatment in children enrolled in a prospective cohort study in a high-burden setting

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Background: Tuberculosis (TB) treatment efficacy depends on adherence, but objective adherence data in children are limited. We report preliminary results from a diagnostic study that assessed children on TB treatment using caregiver reports and a urine dipstick that changes color when INH metabolites are detected within 48 hours of intake.
Design/Methods: Among children aged ≤15 who initiated standard 6-month treatment for drug-sensitive TB in a prospective cohort study in Nairobi, Kenya, with available urine samples, we assessed adherence using caregiver reports and urine dipstick tests during study visits corresponding to weeks 2, 4, 8, 16, and 24 of TB treatment. Optimal caregiver-reported adherence was defined as the reported ingestion of ≥80% of prescribed pills over all the visits. Consistent biomarker-confirmed adherence was defined as having a positive biomarker test at all visits. We compared caregiver-reported adherence with biomarker results and evaluated correlates of biomarker-confirmed non-adherence. We used generalized estimating equations to evaluate the correlates of negative biomarker tests at each visit.
Results: Among 188 children of median age 4.4 years (IQR 2.7, 7.1), 436 biomarker assessments were conducted (median 3 assessments (IQR 2, 4)/child). Biomarker-confirmed adherence was identified in 79.8% (348/436) of assessments. While 87.2% of caregivers (164/188) report-

ed optimal adherence, consistent biomarker-confirmed adherence was observed in 63.3% (119/188) children. Of 164 children with optimal caregiver-reported adherence, 94.9% (n=150) had at least one positive test, and 62.8% (n=103) had consistent biomarker adherence.
The concordance between caregiver-reported and consistent biomarker adherence results was 61.1% (kappa=-0.021, p=0.76). Caregiver reports of missed doses since the last study visit showed a trend for being associated with negative biomarker tests (risk ratio [RR] 0.71; 95% CI 0.49-1.01, p=0.059).
Conclusions: Biomarker-confirmed adherence was modest (63.3%) and differed substantially from caregiver-reported adherence (87.2%). Additional efforts are needed to support adherence, especially among children whose caregivers report missed doses.

EP03-726-18 Integrating paediatric drug-resistant TB into primary care: Mozambique's decentralisation strategy and its impact on detection

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Background and challenges to implementation: Paediatric drug-resistant tuberculosis (DR-TB) is historically under-diagnosed and under-treated in high-burden settings due to limited diagnostic access and centralised care models. In 2017, Mozambique's National TB Program launched a national decentralisation strategy to improve paediatric DR-TB detection and access to care.
Intervention or response: We conducted a retrospective national program evaluation using routine surveillance data from 2017 to 2024.
The decentralisation strategy included three pillars: (1) health system integration of TB screening into Integrated Management of Childhood Illness (IMCI) protocols, nutrition programs, and mandatory screening for all children living with HIV (CLHIV) at follow-up visits, supported by training 4,372 frontline providers in paediatric TB screening and simplified diagnostic algorithms; (2) diagnostic expansion through Xpert MTB/RIF Ultra deployment to 120 sites, with standardised training in sample collection including stool-based testing and specimen referral systems; and (3) community-based detection through training 2,400 community health workers in household contact tracing.
Results/Impact: Paediatric DR-TB case notifications increased from 34 (3.6% of total DR-TB cases) in 2017 to 122 cases (8% of total DR TB cases) in 2023. Improvements were also observed in early case detection and access in rural areas, though quantitative data on time to diagnosis and treatment initiation were not captured.
Limitations: The evaluation used routine program data, which may be affected by reporting inconsistencies, data incompleteness, and misclassification. The lack of a control group limits causal inference, and variations in implementation fidelity across provinces were not systematically assessed.

Year	Total MDR TB cases	MDR TB cases 0-14 years	% MDR TB in children among total cases
2017	953	34	3.6%
2028	1206	60	5.0%
2019	1388	88	6.3%
2020	1364	95	7.0%
2021	1366	78	5.7%
2022	1441	100	6.9%
2023	1685	150	8.9%
2024	1533	122	8.0%

Table 1: Trends in Pediatric and Total MDR-TB case notification, Mozambique, 2017-2024.

Conclusions: Decentralising paediatric DR-TB services through health system integration, diagnostic expansion, and community-based approaches significantly improved case detection in Mozambique. This model offers a scalable framework for improving paediatric DR-TB outcomes and reducing inequities in similar high-burden settings.

EP03-727-18 Trends in the management and outcome of paediatric multi-drug-resistant TB in Namibia from 2013 to 2023: A review of national registry data

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Background: Namibia has a high-burden of tuberculosis (TB) and childhood TB with multidrug-resistant (MDR) TB posing additional challenges. Recent advances led to the introduction of Xpert MTB/RIF as first-line diagnostic test and new and repurposed drugs for the treatment of

MDR-TB which are associated with favourable outcome.
Design/Methods: Retrospective review of Namibian national registry data from 2013 to 2023 of children aged 0-14 years with MDR-TB. National census data were used to estimate annual case notification rates (aCNRs).
Results: 217 episodes were available for analysis. The median age was 4 years (IQR 1-10). 120 (55.3%) were female and 21 (9.7%) were living with HIV. 168 (91.3%) were classified as MDR-TB with only 2 XDR and no pre-XDR cases. The aCNR increased by 75% from 1.2 in 2013 to 2.1 per 100,000 population in 2023. The treatment duration significantly decreased from a median duration of 19 months (IQR 19-23) to 11 months (IQR 9-13), respectively ($p < 0.001$). 98 individuals (59.4%) received a treatment regimen containing injectables, whereas 67 (40.6%) received an all-oral treatment regimen containing two or more WHO class A drugs and/or delamanid. By 2021 only all-oral regimens were used (fig. 1a). Outcome was unfavourable in 48 (23.9%) individuals and 18 (9%) died. The proportion of children with unfavourable outcome, and those who died, did not decrease over time (fig. 1b). There was no significant association between year of registration or treatment regimen and outcome.

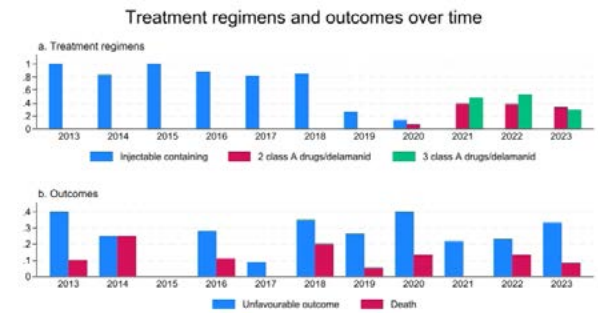

Figure 1: Panel a. shows the porportion of children who received standard regimens for multidrug-resistant tuberculosis containing injectables (blue), 2 class A drugs/delamanid (red) or 3 class A drugs/delamanid (green). Panel b. shows the proportion of children with unfavourable outcome (indluding death) (blue) and the proportion of children who died (red).

Conclusions: Whilst the proportion of children with unfavourable outcome and death are in keeping with internationally observed levels, both did not decrease over the study period despite the introduction of Xpert MTB/RIF in 2017 and new oral treatment regimens. Other factors along the paediatric MDR-TB care cascade potentially limiting the benefits of a rapid diagnosis of MDR-TB and newer treatment regimens should be assessed.

EP03-728-18 Pharmacokinetics and safety of clofazimine in children with rifampicin-resistant TB with novel dosing schedule

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Background: Clofazimine is a routinely recommended drug for rifampicin-resistant tuberculosis (RR-TB) treatment. CFZPK2 was a phase I/II study evaluating pharmacokinetics, safety and tolerability of clofazimine in children. The dosing schedule (Table 1) was modelled based on findings from the CFZPK1 study (Hughes et al, J. Infect. Dis., 2025). The study aim was to evaluate exposure and safety of the revised dosing schedule using a clofazimine tablet formulation.

WHO weight bands	Clofazimine dose	Dosing frequency
3 to < 5 kg	15 mg	Daily
5 to < 7 kg	20 mg	Daily
7 to < 10 kg	25 mg	Daily
10 to < 16 kg	40 mg	Daily
16 to < 24 kg	50 mg	Daily
24 to < 30 kg	75 mg	Daily

Table 1. Dosing schedule.

Design/Methods: Children receiving <12 weeks of routine RR-TB treatment were enrolled. Participants receiving clofazimine gel capsule formulations (Novartis) in routine care switched to a daily-dosed clofazimine tablet (Macleods) dispersed in water. Six pharmacokinetics samples were collected over 24 hours at 2 and 12 weeks on study. Data were analysed using population pharmacokinetic modelling including standard allometric scaling. Adverse events were monitored over the 12-week study period.
Results: Twelve children with median age 2.8 (range 0.6-8.2) years and median weight 12.1 (range 7.77-29.6) kg were enrolled. A published two-compartment model, with first-order absorption and elimination described the data well, but using a proportional error model. The median maximal concentration and time to maximal concentration was 1.08 (range 0.464-1.53) µg/mL and 8.17 (range 7.42-8.59) h, respectively. The predicted median weekly steady state area-under-the curve ($wAUC_{ss}$) was 107 (range 76.7-273) mg*h/L, while the predicted $AUC_{0-24h,week\ 2}$ and $AUC_{0-24h,week12}$ was 14.7 (range 4.23-45.2)

mg*h/L and 22.9 (range 10.0-34.0) mg*h/L, respectively. There were two severe adverse events (hepatotoxicity, skin hyperpigmentation) possibly related to clofazimine, but no clofazimine-related serious adverse events. There were five instances of QTcF prolongation of >460-<480 ms in three participants.

Conclusions: The median $wAUC_{ss}$ (107 mg*h/L) was closer to the previously defined adult target of $wAUC_{ss}$ (112 mg*h/L) than that reported in CFZPK1 ($wAUC_{ss}$ 163 mg*h/L). This suggests that the revised clofazimine dosing schedule is more appropriate for children with RR-TB but requires further evaluation.

EP04 Strenghtening laboratory systems for TB management

EP04-729-18 Operational challenges in TB laboratory networks: An analysis of delays in specimen processing and result reporting

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Background: Efficient tuberculosis (TB) laboratory networks are critical for early diagnosis and treatment initiation. Despite Nigeria having one of the highest TB-burden globally with an estimated 452,000 incident cases in 2022, the country faces significant challenges in its diagnostic capacity, with only 30% of cases being detected through laboratory confirmation.

The fragmented nature of TB laboratory networks in Nigeria, characterized by inconsistent quality assurance systems and limited coordination between facilities, contributes to diagnostic delays. This study investigates delays in specimen processing and result reporting in TB laboratory networks in Nigeria.

Design/Methods: We abstracted time-stamped records from the Registers at the National Tuberculosis Reference Laboratory Centre Zaria covering January-December 2023 for Acid Fast Bacilli Smear Microscopy, culture, and drug susceptibility testing involving 2,347 specimens. Time-interval analysis and multivariate regression were performed using Stata version18.

Results: It was evident that there were delays in specimen processing. A median 12-day delay (IQR: 10-15) between collection and processing was experienced and 28% of specimens exceeded WHO recommended 7-day processing window.

With reporting delays, it was revealed that a median of 8-day delay (IQR: 7-10) post-processing and 22% discordance in critical result reporting times between urban and rural labs ($p<0.01$). Some of the causes of these delays included infrastructure gaps accounting for 42% of delays

(aOR=3.1, 95%CI:2.4-4.0), Staff-shortages increased processing time by 37% (p=0.003) and transportation challenges caused 2.8-day average delay per specimen.
Conclusions: This study highlights delays in specimen processing and reporting which can be addressed through a phased-intervention framework involving; immediate deployment of automated specimen tracking systems to minimize transportation delays, mid-term enhancement to rapid diagnostic capacity in high-volume laboratories, and long-term implementation of digital reporting platforms with real-time delay alerts.
These interventions can be integrated with targeted workforce expansion and continuous performance monitoring for sustained improvements in laboratory efficiency, diagnostic turnaround-time, and patient outcomes and satisfaction.

EP04-730-18 Strengthening TB diagnosis: Integrating new molecular platforms into South Africa's National TB Programme

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Background: The National Health Laboratory Service (NHLS) has operated the Tuberculosis (TB) Molecular Programme for over a decade, initially utilizing the Cepheid GeneXpert platform with Xpert MTB/RIF and later Xpert MTB/RIF Ultra assays. Since its inception, the GeneXpert programme has processed over 27 million tests in 165 laboratories.
In 2021, following the World Health Organization's (WHO) recommendation to incorporate additional moderate-complexity molecular assays, the NHLS adopted a diversified diagnostic approach to enhance TB detection and drug resistance testing capabilities.
Design/Methods: As part of its diversification strategy, NHLS implemented a volume-based model for molecular diagnostics, introducing Roche's cobas MTB and cobas MTB-RIF/INH assays at eight high-volume sites, BD MAX MDR-TB at 74 sites, and GeneXpert Xpert MTB/RIF Ultra at 82 sites. The new assays detect both isoniazid (INH) and rifampicin resistance, crucial for optimizing TB treatment. Implementation included site assessments, instrument placement, staff training, and workflow changes. Clinical transition involved stakeholder engagement and updated TB diagnostic guidelines for smooth integration into routine care.
Results: The BD MAX MTB-MDR was implemented in November 2023, while the cobas MTB program was implemented later in May 2024 due to requirements for renovations and equipment relocation. To date, BD MAX MDR-TB has processed over 1 million tests, and the cobas MTB and MTB-RIF/INH assays have conducted over 300,000 tests, both assays reporting MTB detection rates of 6% and INH resistance ranging between 4% and 5%. Key lessons learned highlight the importance of change management, establishing communication channels to identify challenges early, and proactively addressing the complexities of evolving laboratory workflows.
Conclusions: The diversification of the TB Molecular Programme has enhanced diagnostic capacity, improved drug resistance detection, and aims to strengthen TB management within the national healthcare system.
Diversification requires change management to provide a structured approach for adapting new technologies, processes, and workflows to ensure smooth transitions.

EP04-731-18 Bridging turnaround time gaps inTB treatment initiation: Assessing the impact of Phygital training in corporate laboratory settings in India

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Background and challenges to implementation: Engaging the private sector, particularly corporate laboratories, is vital to closing the tuberculosis (TB) notification gap in India. To enhance real-time reporting, ensure data integrity, and strengthen public health linkages, a blended "phygital" (physical + digital) training program was developed and implemented.
This study evaluates its impact on laboratory performance and the turnaround time (TAT) for TB treatment initiation, contributing to the broader goal of TB elimination in India.
Intervention or response: Between November 2024 and March 2025, a structured training module was deployed across 11 corporate laboratory chains operating in 28 states. A total of 821 laboratory representatives from 437 laboratories—covering over 10,000 collection centers—were trained. The program focused on improving digital TB notifications through the Ni-kshay platform and enhancing compliance with Annexure 15A reporting protocols. A pre-post evaluation design was used, triangulating routine TB notification data with training records, documentation audits, and lab-level reporting indicators. Key outcome metrics included treatment initiation TAT, facility-appropriate PwTB enrolment, data completeness, and reporting timeliness. Statistical analyses were conducted using chi-square and paired t-tests ($p < 0.05$).

Results/Impact: Following the intervention, enrolment of PwTB at appropriate private facilities increased by 13% ($p < 0.05$). Median TAT from diagnosis to treatment initiation significantly decreased from 7 to 4 days ($p < 0.01$). Notable improvements were observed in data completeness and adherence to Annexure 15A, reflecting better linkage to early treatment. However, laboratories with high staff turnover exhibited slower improvements, underscoring the need for periodic refresher training.
Conclusions: The phygital training model demonstrated measurable improvements in TB notification practices and digital reporting compliance among private laboratories. Its scalable, adaptive design offers a promising pathway to enhance private sector accountability and expedite progress toward India's TB elimination targets.

EP04-732-18 Strengthening laboratory services for drug resistance testing of bedaquiline

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Background and challenges to implementation: A crucial component for the success of shorter, 6-9 months all-oral BPaLM regimen for the treatment of multidrug-resistant tuberculosis (MDR-TB) is the availability and accessibility of drug susceptibility testing (DST) for Bedaquiline (BDQ). To address this need, NTEP adopted a strategic approach aimed at strengthening laboratory infrastructure, building capacity, ensuring quality assurance, and establishing effective laboratory linkages for BDQ DST.
Intervention or response: Burden of drug-resistant TB (DRTB) was assessed State-wise, and capacity of existing certified laboratories was reviewed. To meet the estimated demand for DST among 63,936 MDR/RR-TB patients, gaps identified based on laboratory capacity, human resources, infrastructure, and equipment.To improve turnaround time for baseline BDQ DST and ensure geographic equity, potential laboratories in each State were evaluated. Expansion of BDQ DST was planned in phases for 62 laboratories, with a goal of at least one certified laboratory per State. Multiple laboratories were prioritized for high-burden and geographically large States.
Results/Impact: In Phase I, five National Reference Laboratories (NRLs) and 26 Culture and Drug Susceptibility Testing (CDST) laboratories were selected for capacity building. Hands-on training was conducted at SN-RL-NIRT, Chennai in November - December 2024. The programme division ensured timely supply of pure Bedaquiline drug powder to expedite the certification process. Standard Operating Procedures, diagnostic guidance, and certification protocols were disseminated to States. Continuous monitoring to ensure timely certification of laboratories to support the rollout of the BPaLM regimen.
Conclusions: Strategic implementation led to the expansion of BDQ DST services in 18 States, covering a significant proportion of the national DRTB burden. In Phase II, 17 additional laboratories identified extend services to eight more States. States with lower DRTB burden linked to certified laboratories in neighbouring States or to their respective NRLs. Until certification is achieved, patients initiated on BPaLM are linked to existing certified laboratories for baseline BDQ DST.

EP04-733-18 Diagnostic accuracy of SOS-Xpert Ultra on frozen stool samples for TB detection in rural Angola: Preliminary findings

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Background: In 2021, WHO endorsed stool testing for tuberculosis diagnosis in children using Xpert MTB/RIF Ultra (Xpert). The Simple One-Step (SOS) method offers a feasible approach in resource-limited settings, yet current protocols only validate fresh stool. In remote or low-resource areas, freezing stool before processing may be necessary due to delays from stockouts, equipment failure or transport limitations—yet current guidelines offer no recommendations for frozen specimens. We evaluated the diagnostic concordance of SOS-Xpert on frozen versus fresh stool in adults and children with presumptive TB in rural Angola.
Design/Methods: We report preliminary data from 46 patients (29 adults, 17 children) recruited at Nossa Senhora da Paz Hospital in Cubal. Each stool sample was divided into two aliquots (0.8 g or 2 mL, depending on con-

sistency per Bristol scale). One was tested fresh; the other frozen at -20 °C. Median freezing duration was 13 months (IQR: 12.4-15.5). Both aliquots were processed using SOS and analysed with Xpert.
In children, fresh stool served as an internal comparator. All had pulmonary TB-compatible symptoms; most had abnormal chest radiographs and started treatment based on clinical evaluation. In adults, respiratory Xpert results supported interpretation.
Results: Concordance between fresh and frozen stool results was high. In adults, frozen stool matched all Xpert-positive respiratory samples, which were also positive in fresh stool (sensitivity: 100.0%, specificity: 94.4%).
In children, sensitivity was 90.0% and specificity 85.7%. Three discordant cases were observed: two in children (one positive only in frozen, one only in fresh) and one in an adult (indeterminate in fresh).
This suggests potentially lower diagnostic yield in children, possibly related to the paucibacillary nature of disease and variability in stool composition.

Group	Frozen stool results	Fresh Stool result		
		Detected	Not detected	Indeterminate
Adults	Detected	11	0	0
	Not detected	0	17	1
Children	Detected	9	1	0
	Not detected	1	6	0

In adults, Xpert MTB/RIF Ultra on sputum was also available to support diagnostic interpretation. In children, fresh stool was used as the internal comparator. Discordant cases: CUA061, indeterminate in fresh, not detected in frozen; CUP017, detected in fresh, not detected in frozen; CUP090, not detected in fresh, detected in frozen ("Very Low").

Table 1. Comparison of SOS-Xpert Ultra results on fresh vs. frozen stoll samples (preliminary data)

Conclusions: Preliminary findings suggest that frozen stool processed with the SOS method shows high concordance with fresh samples and may be a practical alternative where immediate testing is not feasible.

EP04-734-18 Diagnostic performance of the FluoroType MTBDR assay for rifampicin and isoniazid resistance in routine laboratory setting

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Background: Rapid and accurate detection of *Mycobacterium tuberculosis* (M. tuberculosis) and its associated drug resistance is vital for timely treatment initiation. Recently FluoroType MTBDR was introduced, a novel molecular diagnostic test designed to detect resistance to rifampicin (RIF) and isoniazid (INH). This study aimed to evaluate the performance of the FluoroType MTBDR assay in a routine laboratory setting.
Design/Methods: 152 cryopreserved samples of drug-resistant and drug-susceptible isolates, all previously characterized using Genotype MTBDRplus were eligible for inclusion. The FluoroType results were then compared to those of Genotype MTBDRplus and GeneXpert MTB/RIF assays. Whole genome sequencing (WGS) results were available for 35 isolates and used to resolve discrepancies. WGS-based mutations were considered the final reference for determining resistance patterns in cases of discordant results. Sensitivity, specificity, negative predictive value, and positive predictive value were calculated to assess the diagnostic performance of FluoroType MTBDR.
Results: For the detection of resistance to RIF, FluoroType demonstrated a superior sensitivity of 100% (95% CI, 96-100) and a specificity of 92% (95% CI, 82-98), surpassing the performance of Genotype MTBDRplus. For the detection of resistance to INH, FluoroType achieved a sensitivity of 91% (95% CI, 77-98) and a specificity of 99% (95% CI, 95-100), both of which were higher than the corresponding values for Genotype MTBDRplus. These findings suggest that FluoroType MTBDR offers a highly accurate and reliable alternative to Genotype MTBDRplus for the detection of resistance to RIF and INH in *M. tuberculosis* isolates.
Conclusions: In conclusion, the FluoroType MTBDR assay demonstrated high sensitivity and specificity for detecting rifampicin and isoniazid resistance, outperforming Genotype MTBDRplus. Its superior diagnostic accuracy makes it a reliable alternative for routine laboratory settings, facilitating timely and precise tuberculosis drug resistance detection.

EP04-735-18 Deeplex Myc-TB-based single-nucleotide polymorphism(SNP) analysis of genetic diversity for *M. tuberculosis* strains in Eswatini

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Background: Tuberculosis remains a major public health threat in Eswatini, driven by the transmission of highly resistant MDR-TB strains, including the *rpoB* I491F MDR MTBC outbreak clone circulating for over 30 years. These strains are resistant to first-line and several second-line drugs, highlighting the urgent need to break transmission

chains. This study examines *Mycobacterium tuberculosis* genetic diversity using Deeplex-based SNP analysis to understand evolutionary dynamics, and resistance mechanisms, helping to identify common lineages and drug resistance patterns in Eswatini.

Design/Methods: The research is conducted at the National Tuberculosis Reference Laboratory (NTRL) in Eswatini on over 200 samples from 2022 to 2025, included 233 samples in the final analysis. The Deeplex-Myc TB Kit was used to for Sequencing, and a web-based Deeplex pipeline was used for analysis to determine the resistance patterns and the genetic diversity.

Results: The results indicated a significant level of genetic diversity. Lineage 4 was found to be the most predominant, accounting for 79.8% (186/233) of the samples. However, the Deeplex Myc-TB kit accurately identified only 20% (38/186) of these Lineage 4 strains, with the Deeplex pipeline failing to delineate the remaining 80%, classifying them as lineage other than 4.9. Lineage 1 accounted for 8.5%, Lineage 2 for 5.5%, and Lineage 3 for 0.02%. The analysis suggested that Lineage 1 had a higher prevalence of MDR-TB and the most Pre-XDR cases (excluding those defined as „other than 4.9" category).

Category	Lineage1	Lineage2	Lineage3	Lineage4	Lineage6	No Lineage Specific	OtherThan4.9	Total
MDR	14	3	1	7		1	37	63
MDR+BDQ	2	1		1	2	1	67	74
nonMDR	1	6	2	23		3	22	57
preXDR	3	1					1	5
RR	0	1		2		2	2	7
S	0	1		5		1	12	19
XDR	0	0					6	6
(blank)	0	0				1	1	2
Total	**20**	**13**	**3**	**38**	**2**	**9**	**148**	**233**

Conclusions: The presence of various lineages, along with the indication of differing drug resistance profiles among them, underscores the genetic diversity of *M. tuberculosis* in Eswatini. The study concluded that due to the Deeplex kit's inability to fully distinguish Lineage 4, whole-genome analysis would be essential for a more comprehensive understanding of the genetic diversity.

EP04-736-18 Added value of Truenat as a first intention test for the detection of *M. tuberculosis* in the Democratic Republic of Congo

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Background: Despite being highly preventable and generally curable disease, tuberculosis (TB) remains a major public health threat worldwide. The Democratic Republic of Congo (DRC) is among the 30 high-burden TB countries with an estimated incidence of 316 per 100,000 inhabitants. To reduce the incidence of TB in the country, it is essential to use innovative approaches. Beside GeneXpert, Truenat was recommended as a first intention rapid molecular diagnostic test by WHO rather than smear microscopy.

Design/Methods: Truenat was installed in 38 centres of diagnosis and treatment in four provinces (Kinshasa, Lualaba, Haut Katanga and Kasai Oriental) known to be hotspots for TB and MDR-TB. Given the higher presumptive burden in these provinces and limited coverage of Truenat, smear microscopy was also performed. Laboratory technicians were capacitated in installing and using Truenat machine.

Results: From 2022 to 2023, a total of 27 185 samples were tested using Truenat. 6 714 (24.7%) tested positive for *Mycobacterium tuberculosis (MTB)* (as compared to 18% positivity rate for microscopy). Of these, 493 (7.3%) were rifampicin resistant (RR).

Conclusions: Performing Truenat test was feasible and user-friendly in settings with limited resources and infrastructure. Truenat presented an additional value of identify more cases of MTB as compared to smear microscopy. These machines are expected to play an important role in identifying missing TB cases.

EP04-737-18 Operational performance of GeneXpert for TB diagnosis in West Java province, Indonesia: A public health evaluation

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Background and challenges to implementation: GeneXpert is instrumental in tuberculosis diagnosis. Operational challenges are widely reported, but comprehensive evaluations of its operational performance are rare.
Intervention or response: We conducted health facility assessments in 40 community health centres with GeneXpert machines in West Java, Indonesia, and interviewed nurses, laboratory technicians, and program officers. We developed indicators and data collection tools using the World Health Organization GeneXpert implementation manual and Consolidated Framework for Implementation Research.
Results/Impact: GeneXpert has been implemented across the system with variable success. Several indicators scored below 75%, including nurse training (42%), technician's knowledge (68%), proportions of samples referred (67%), referred from private providers (2%), transported ≤1 day (61%), and tested in ≤1 day (72%), facilities with annual test volumes ≥3000 (16%), error rates ≤3% (46%), no result rates ≤1% (66%), absence of cartridge stockouts (72%) or machine module failure (37%), annual machine calibration (58%), stable power supply (0%) and adequate ventilation (60%). Barriers spanned multiple domains and layers. At CHCs, these included physical infrastructure, information technology, and a lack of (trained) human and material resources. Wider barriers involved local conditions (e.g. remote and difficult terrain, administrative processes), challenges with external organisations, insufficient funds, and large-scale events (e.g. active case finding). Continuous system adaptations and high staff motivation through proactive efforts and enthusiasm were key facilitators.
Conclusions: The Indonesian TB program has made significant progress in GeneXpert implementation. Residual challenges require multisectoral solutions and underscore the need to address real-world constraints in designing and implementing new TB diagnostics.

EP04-738-18 Blazing the trail of TB diagnosis in Nigeria: A journey that made sense

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Background and challenges to implementation: Nigeria started the implementation of molecular WHO-recommended rapid diagnostic (mWRD) in 2011. Lessons learnt during project implementation demonstrated that adding more tools to the pool without strategic placement does not necessarily lead to more people being diagnosed. for improved diagnosis, the strengths and weaknesses of each tool should be evaluated and synergized with existing tools for optimal utilization. We reviewed the strategic deployment of molecular tools and diagnostic benefits over time.
Intervention or response: Nigeria experienced a huge evaluation gap despite the massive rollout of Xpert machines across 36 states. Poor machine utilization from power challenges, non-decentralization of testing to the community, primary health facilities, and the private sector where individuals first seek help were some identified reasons for the gap. To bridge the gap, KNCV Nigeria and the National TB program conducted a mapping of health facilities and devised a strategy on tool placement. TB LAMP was deployed to facilities with high workload and pervasive power issues owing to its solar system and high throughput. The 2-module Truenat instrument was deployed to primary health facilities with limited power supply, not necessarily facilities with high workload. Both tools were also prioritized for community active case finding due to their portable size. While Xpert remained in facilities with adequate power supply.
Results/Impact: A 4-year retrospective data analysis across the 14 KNCV-supported states showed a yearly increase in the number of persons with presumed TB and a steady decrease in evaluation gap from 35% in 2021 to 9% in 2024. The number of tests increased by 56.9% in 2024, consequently, the number of persons detected to have TB steadily increased over time.

Year	# Persons with presumed TB	Total Evaluated	Total cases identified	Evaluation gap	# Xpert Machines	#TB lamp Machines	#Truenat Machines
2021	862787	562237	51826	35%	184	11	28
2022	863915	664640	63136	23%	212	22	28
2023	1174903	987417	89518	16%	228	53	28
2024	1435395	1306955	113867	9%	236	83	28

Table 1: Distribution of diagnostics across 14 selected states and utilization over time

Conclusions: The results demonstrated that the strategic placement of diagnostics increased the utilization of machines, reduced evaluation gaps, and ultimately increased TB detection.

EP05 Childhood TB: Diagnosis and case-finding

EP05-739-18 Increase in TB diagnosis among children after implementing new WHO treatment decision algorithms in 5 sub-Saharan African countries

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Background: Almost half of children with tuberculosis (TB) go undiagnosed. In 2022, the World Health Organization (WHO) recommended two new treatment decision algorithms (TDAs) to facilitate TB case finding in children. We assessed the impact of TDAs implementation on TB diagnosis in Guinea, Niger, Nigeria, South Sudan and Uganda.
Design/Methods: In this pre-post research study the number of children under 10 years of age initiated on TB treatment, or with presumptive TB, over the total consultations or admissions of children of the same age, were retrospectively collected from routine programmatic sources 3-18 months prior to and following the introduction of TDAs in study sites. Comparisons of the TB treatment initiation rates before and after TDAs implementation were limited to the same calendar months year-over-year to control for potential seasonal effects.
Results: The percentages of children identified with presumptive TB increased from 11.4% (95%CI: 10.2 – 12.7) before TDAs implementation to 31.6% (95%CI: 30.0 – 33.1) after TDAs implementation in Nigeria and from 6.2% (95%CI:5.3 – 7.3) to 13.0% (95%CI:11.7 – 14.5) in South Sudan. The percentages of children initiating TB treatment increased in all sites after TDAs implementation (Table 1). Average proportional growth in percentage of children initiating TB treatment ranged from 1.2 fold in an inpatient therapeutic feeding center (Nigeria) to 5.0 in an outpatient cohort of children living with HIV (Guinea). Monthly fluctuations in case finding were observed, coinciding before TDA implementation with consultation and admission volumes, and with factors like the TDA focal person's presence, refresher training, and caseload changes afterward.

	Site-specific time periods		Children initiated on TB treatment over total consultations or admissions	
Site	Before algorithm implementation	After algorithm implementation	Before algorithm implementation % (95% CI)	After algorithm implementation % (95% CI)
Guinea	January 2023 – November 2023	January 2024 – November 2024	12/1363 0.9 (0.5 – 1.5)	61/1397 4.4 (3.4 – 5.6)
Niger	June 2022 - May 2023	June 2023 - May 2024	30/4804 0.6 (0.4 – 0.8)	106/4926 2.2 (1.8- 2.6)
Nigeria	January 2022 - December 2022	January 2024 - December 2024	234/8072 2.9 (2.6 – 3.3)	413/12,018 3.4 (3.1 –3.8)
South Sudan	January 2023 – November 2023	January 2024 – November 2024	42 / 2360 1.8 (1.3 - 2.4)	113/2294 4.9 (4.1 – 5.9)
Uganda	December 2022 – February 2023	December 2023 - February 2024	4/631 0.6 (0.2 - 1.6)	24/618 3.9 (2.6 – 5.7)

Conclusions: These results suggest that the WHO-recommended algorithms helped increase presumptive TB detection and TB diagnosis. The TDAs can be an important tool to close the gap of TB under-diagnosis in children. When TDAs are implemented, increased TB medication supply should be planned for.

EP05-740-18 Enhancing detection and enrollment of childhood TB through integrated community and facility-based approaches in high-burden settings: Lessons from two TB high-burden states in Northern Nigeria

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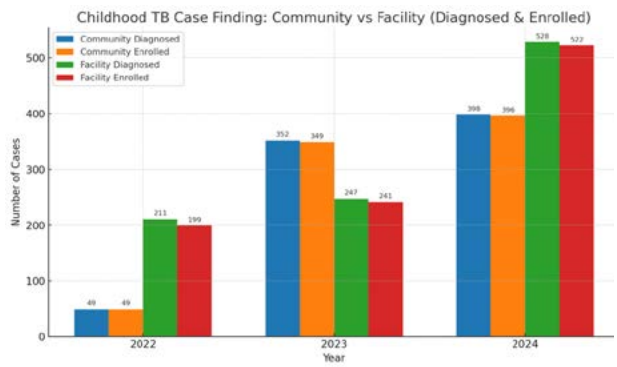
Background and challenges to implementation: Childhood tuberculosis (TB) remains a major public health concern in high-burden countries, with many cases going undetected due to non-specific symptoms, limited access to diagnostic tools, and poor linkage to care. Vulnerable populations such as children in slums, internally displaced persons (IDP) camps, Almajiri schools, and orphanages are particularly at risk. Addressing these challenges requires targeted, integrated interventions across both community and facility levels.
Intervention or response: Between 2023 and 2024, a combined strategy of targeted community outreaches and facility-based screening was implemented to enhance TB detection among children. The approach featured community testing weeks in schools, slums, IDP camps, Almajiri homes, and orphanages, focusing on children aged 0–14. Simultaneously, TB screening was integrated into

routine services at immunization clinics, Pediatric Outpatient Departments, Emergency Pediatric Units, and nutrition clinics.
Healthcare workers were trained on childhood TB screening, sample collection techniques (including stool and sputum), and clinical diagnosis. Linkage to care was enhanced through strengthened referral systems and structured follow-up processes.
Results/Impact: There was a significant increase in childhood TB case detection at both community and facility levels in 2023 and 2024 compared to 2022. Community-based interventions recorded a rise from 49 cases in 2022 to 352 in 2023 and 398 in 2024, while facility-based detection increased from 211 cases in 2022 to 247 in 2023 and 528 in 2024.



Conclusions: Integrating TB screening into both community outreach targeting children-focused groups and existing pediatric health services significantly improved childhood TB detection enrollment. The approach proved effective in reaching underserved populations and strengthening the continuum of care for children with TB.

EP05-741-18 Diagnostic accuracy of new treatment decision algorithms for TB in children: A multi-country diagnostic study

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Background: New treatment decision algorithms for pulmonary TB in children include, in addition to laboratory testing, a score based on clinical, and where available, chest X-ray features. We assessed the diagnostic accuracy of these new algorithms as well as the diagnostic cascade in 5 sub-Saharan African countries.
Design/Methods: Prospective diagnostic study including children under 10 years with signs and symptoms of TB. Study sites included primary and higher health care facilities, nutritional centres, and HIV services in Guinea, Niger, Nigeria, South Sudan, and Uganda. Children were followed for 2 months. Reference standard was based on the international consensus definition for confirmed TB, unconfirmed TB and unlikely TB.
Results: Among 1864 participants enrolled, the median age was 1.7 years (IQR: 0.8-3.0), 851 (46.3%) were female, 1412 (76.9%) hospitalized, 1279 (69.6%) severely malnourished, and 203 (11.0 %) living with HIV (CLHIV). In total, 493 (26.8%) children were diagnosed with TB, 389 (78.9%) within one week of first assessment. Reasons for TB treatment were: 321 (65.1%) clinical or clinical-radiological algorithm score, 96 (19.5%) contact person with TB, 28 (5.7%) positive Xpert MTB/RIF, 33 (6.7%) positive TB-LAM. Among severely malnourished children, the main reason for TB treatment was the algorithm score (74.5%). A frequent reason for TB treatment was, among CLHIV, positive TB-LAM result (23.7%) and among children neither severely malnourished nor CLHIV, contact person with TB (48.7%). Among 1640 children, 333 (20.3%) had TB (of which 24% were confirmed) and 1307 (79.7%) unlikely TB, as per the reference standard. The algorithms sensitivity and specificity were 91.3% (95%CI 88.3-94.3) and 87.9 (95%CI 86.1-89.7), respectively.
Conclusions: The algorithms diagnostic accuracy was high. Clinical and clinical-radiological scores triggered most of the decisions to initiate TB treatment and highlight the importance of these assessments as part of a multi-faceted approach to diagnose TB in children.

EP05-742-18 Interpreting Xpert MTB/RIF Ultra trace-positive results in children: Experience from a large referral hospital

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Background: Despite limited paediatric data, the World Health Organization recommends that children with Xpert MTB/RIF Ultra trace-positive results should be treated as having tuberculosis (TB), especially in high-burden settings. We evaluated children with Xpert Ultra trace-positive results only.
Design/Methods: Prospective routine-care microbiological surveillance including laboratory and clinical data were collected in children <13 years of age from March 2017 through February 2024 at Tygerberg Hospital, Cape Town, South Africa.

Characteristics of children 0-<13 years of age with trace-positive Xpert MTB/RIF Ultra	Number = 254 (%) or Median (Interquartile range)
Male sex	135 (53.1)
Weight for age (NCHS): <3rd centile	73 (28.7)
3-10 centile	46 (18.1)
Tuberculin skin test positive (≥10 mm)	30/61 (49.2)
Primary specimen type	
Respiratory samples (sputum, gastric aspirate, tracheal asp, BAL)	208 (81.9))
Pleural effusion	10 (3.9)
Cerebrospinal fluid	16 (6.3)
Lymph node fine needle aspirate	8 (3.1)
Tissue bone or synovial fluid	8 (3.1)
Other	4 (1.6)
When was antituberculosis treatment started	(n=223)
Before specimens taken	61 (27.4)
After specimens taken	162 (72.6)
Timing antituberculosis treatment initiated	
Before specimen obtained (n=59)	21 days (5 days-3 months)
After specimen obtained (n=150)	3 days (1 – 11 days)
Culture results	
Culture attempted	234 (92.1)
Culture not attempted	17 (6.7) (14 CSF; 1 stool; 1 asp; 1 tissue)
Culture contaminated	3 (1.2) (all BAL)
Number of negative mycobacterial cultures – median (IQR) and (range)	2 (1-3) (range 1-10)

Results: Of 1373 children with microbiological results indicating *Mycobacterium tuberculosis*, 254 (18.5%) had only Xpert Ultra trace-positive results. Children's median age (IQR) was 27 (10-55) months; 11/246 (4.5%) were HIV-positive. TB contact was documented in 93/234 (39.7%) children; 73/254 (28.7%) were severely underweight-for-age. In 17 (6.7%; 14 cerebrospinal fluid samples) no culture was done in addition to molecular testing. Sixty-one (24%) children were on antituberculosis treatment (median duration 21 days; IQR 5 days-3 months) before specimens were obtained. Diagnoses assigned retrospectively were pulmonary TB only in 121 (47.6%; 89 non-severe disease), pulmonary and extrapulmonary TB (47; 18.5% – 16 TB meningitis [TBM]), extrapulmonary TB only (27; 10.6% – 10 TBM), unlikely TB or TB infection only (55; 21.7%), and likely laboratory mycobacterial cross- contamination (4; 1.6%). Treatment or TB preventive treatment was started or continued in 223 (87.8%); 31 (12.2%) children had no documented TB treatment or prevention. Six children died – all non-related to TB (Table)
Conclusions: Almost 80% of young children managed at a referral hospital with only Xpert Ultra trace-positive results were considered to have TB disease (half having severe TB), confirming that in high TB-burden settings, young children with Xpert Ultra trace-positive results should generally receive TB treatment. A smaller number could be treated for TB infection. Microbiological yield can possibly be improved by obtaining specimens before any TB treatment, and by requesting mycobacterial culture on larger volumes of cerebrospinal fluid specimens.

EP05-743-18 Impact of implementation of the molecular WHO-recommended rapid diagnostic test on bacteriological confirmation of pulmonary TB in children less than 15 years: A Peruvian cohort

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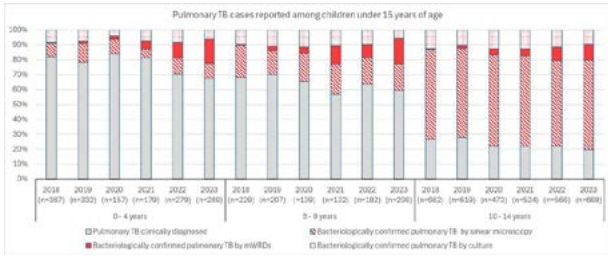
Background: Peru is one of the 30 countries with a high burden of rifampin-resistant tuberculosis (MDR/RR TB) globally. The World Health Organization (WHO) has recommended the use of rapid molecular tests for diagnosing pulmonary tuberculosis since 2010, but implementation in Peru did not occur until 2018. This study aims to assess the impact of the molecular WHO-recommended rapid diagnostic test (mWRDs) on the pediatric population affected by TB in Peru.
Design/Methods: This observational operational research used a national TB program dataset from Peru's Tuberculosis Management Information System (SIGTB), the country's repository for diagnosed TB cases since 2018. Age groups followed WHO-recommended ranges for reporting TB in children and adolescents. Three categories of bacteriologically confirmed pulmonary TB were defined: (1) Confirmed by smear microscopy if positive, regardless of mWRDs or culture results; (2) Confirmed

by mWRDs if positive without a prior positive smear microscopy, regardless of culture results; and (3) Confirmed by culture if positive without prior smear microscopy or mWRDs evidence.
Results: Among children under 15, bacteriological confirmation was achieved in 49% (626/1278) of pulmonary TB cases in 2018, rising to 61% (715/1166) in 2023 (p<0.0001). Among confirmed pulmonary TB cases, mWRD-based confirmation significantly increased from 1.1% (7/626) in 2018 to 21.4% (153/715) in 2023 (p<0.0001). By age group in 2023, mWRDs confirmed pulmonary TB in 50% (47/94) of children aged 0–4 years, 42% (35/84) of those aged 5–9 years (p=0.3), and 13.2% (71/537) of children aged 10–14 years (p<0.0001). Children with MDR/RR-TB diagnosed by mWRDs accessed faster and more accurate second-line anti-TB treatment in a median of 9 days, compared to 26 days among those diagnosed through phenotypic testing (p<0.005).



Conclusions: The implementation of mWRDs has increased bacteriological confirmation of pulmonary TB and reduced the time to begin second-line anti-TB treatment among children under 15 years in Peru.

EP05-744-18 TB in teens: Risk factors for diagnostic delay and age-specific associations with disease severity

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Background: Adolescents account for 12–17% of new tuberculosis (TB) cases globally, yet little is known about diagnostic delays in this age group. Delayed care may increase disease severity and community transmission, especially in settings with high TB burden.
Design/Methods: We analyzed data from a prospective study of 249 adolescents (ages 10–19) treated for rifampicin-susceptible TB at Ministry of Health centers in Lima, Peru, between September 2020 and August 2021. Variables were collected through clinical chart abstraction and a structured survey completed by participants 3–5 weeks after treatment initiation. Diagnostic delay was defined as self-reported time from symptom onset to diagnosis. We used K-means cluster analysis to group adolescents by psychosocial characteristics and examined associations between cluster and diagnostic delay using regression. We also assessed the age-stratified relationship between delay and sputum smear positivity in pulmonary TB.
Results: Median diagnostic delay was 22.5 days (IQR: 7.5–45). Cluster analysis identified three groups; the cluster characterized by the highest levels of poverty, substance use, and childhood trauma had the longest mean delay (44 days vs. 36 and 35 days for the other two clusters), though differences were not statistically significant. Longer diagnostic delays were associated with greater sputum smear positivity in both age groups, but this relationship was statistically significant only among younger adolescents (10–15 years), suggesting that delays lead to more severe disease at diagnosis and increased potential for transmission.

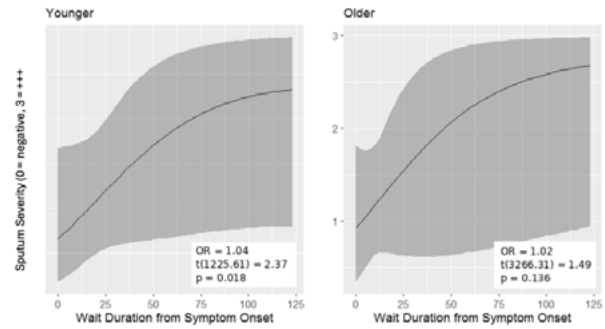

Figure: Sputum smear positivity vs. diagnostic delay. Sputum smear positivity was assessed on a scale of 0 (smear negative) to 3+, indicating the quantity of Mycobacterium tuberculosis visualized on acid-fast microscopy. Diagnostic delay is the number of days between the onset of symptoms and TB diagnosis. The older group, aged 15-19 (mean = 17.8), is distinguished from the younger group, aged 10-15 (mean = 14). The average age for Clusters A and B is 17.8, while for Cluster C, it is 14.

Conclusions: Social and structural factors—such as household instability, food insecurity, and substance use—may contribute to TB diagnostic delays in adolescents. Younger adolescents may be especially vulnerable to severe disease following delayed care. Adolescent-centered interventions that address psychosocial and structural barriers are critical to improving timely diagnosis and limiting transmission.

EP05-745-18 Incorporating paediatric TB surge in polio zero-dose community activities: Learnings from Kaduna State

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Background and challenges to implementation: Pediatric tuberculosis (TB) is frequently underdiagnosed owing to ambiguous symptoms, restricted diagnostic availability, and inadequate integration of TB services within comprehensive healthcare systems. In Kaduna State, Nigeria, the identification of zero-dose children—those who had never been vaccinated—and the management of concealed pediatric tuberculosis loads presented a twin problem. Cultural obstacles, stigma, and inadequate infrastructure further impeded attempts to identify and treat tuberculosis in children.
Intervention or response: To rectify these deficiencies, KNCV Nigeria, supported by USAID financing, included pediatric TB surge initiatives into existing polio zero-dose community outreach efforts. This novel strategy utilized the extensive outreach of polio programs to screen children for tuberculosis, inform carers, and send suspected cases for testing. Community health workers and vaccinators received training to identify tuberculosis signs and enhance referral networks. Community involvement and lobbying facilitated acceptance and participation.
Results/Impact: The approach resulted in a significant increase in tuberculosis case detection among zero-dose youngsters. Presumptive pediatric tuberculosis cases rose from 3,365 in the second quarter to 5,413 in the third quarter (61%) and 7,625 in the fourth quarter (41%). Diagnosed tuberculosis cases increased from 146 in the second quarter to 272 in the third quarter (86%) and 371 in the fourth quarter (36%), with all confirmed patients commencing treatment. Referrals to diagnostic centers increased by more than 40%. The community's confidence and awareness of tuberculosis and immunization services have also enhanced. The results underscore the efficacy of utilizing polio outreach to improve pediatric TB diagnosis in marginalized groups.

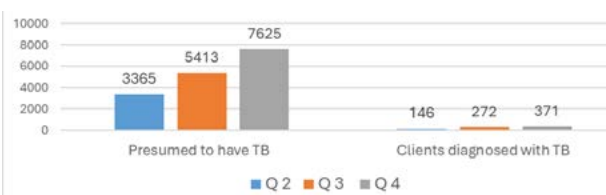

Fig. 1. Kaduna PPM pediatric cascade.

Conclusions: Incorporating pediatric tuberculosis case identification with polio zero-dose outreach is a viable and effective approach for enhancing tuberculosis diagnosis and healthcare accessibility. Expanding this strategy needs continuous financing, enhanced diagnostics, and resilient data platforms to sustain and amplify advancements in pediatric tuberculosis control.

EP05-746-18 Assessment of paediatric TB prevalence among Bacillus Calmette-Guerin vaccinated paediatric age group in Delta State Nigeria

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Background: Tuberculosis (TB) remains a major public health concern in Nigeria, particularly among children, who are more vulnerable to severe forms of the disease. Although the Bacillus Calmette-Guerin (BCG) vaccine is routinely administered to protect against TB, cases continue to emerge within vaccinated paediatric populations. In Delta State, where TB control efforts are ongoing, there is limited data on the prevalence of TB among children who have received the BCG vaccine.
This study seeks to assess the burden of paediatric TB within this group, aiming to better understand the vaccine's protective impact and identify potential gaps in prevention strategies.
Design/Methods: This was a retrospective descriptive study to assess the prevalence of tuberculosis among BCG-vaccinated children in Delta State, Nigeria. It involves analysis of immunization records in selected high burden facility (Ughelli, Warri, Agbor and Ekpan) over a 14 year period (January 2011 to January 2025) with paediatric TB cases diagnosed among the vaccinated over that same period (January 2011 to January 2025). These facilities provide routine TB diagnosis, treatment, and vaccination services.
The target population included children aged 0–14 years who were diagnosed with tuberculosis and had documented evidence of BCG vaccination.
Data were extracted from patient medical records, immunisation registers, and TB treatment registers. Extracted data were coded, inputted and analysed using SPSS version 25.
Results: General Characteristics of the Study Population: A total of 4,426 BCG-vaccinated children aged 0–14 years were randomly reviewed from immunization records across selected high burden health facilities in Delta State. Of these, 34 children (0.77%) were confirmed to have tuberculosis despite documented BCG vaccination status.
Conclusions: Though TB prevalence among BCG-vaccinated children was low, cases persist and as such, strengthening early detection, contact tracing, and vaccine impact monitoring is essential to close prevention gaps and improve outcomes for vulnerable children.

Age and Sex Distribution of TB Cases (n = 34)

Age Group (years)	Male	Female	Total	Percentage (%)
0–4	5	6	11	32.3%
5–9	7	6	13	38.2%
10–14	6	4	10	29.5%
Total	***18 (53%)***	***16 (47%)***	***34***	***100%***

Children aged 5–9 years had the highest prevalence of TB cases (38.3%), with a nearly equal distribution between male and female cases overall.

Type of TB Diagnosis Among Cases

TB Type	Number of Cases	Percentage
Pulmonary TB	32	94.0%
Extra-pulmonary TB	2	6.0%
Total	***34***	***100%***

Pulmonary TB was the most common presentation, accounting for 94%, while extra-pulmonary TB represented 6%.

Diagnostic Methods Used in Confirming TB

Diagnostic Method	Number of Cases	Percentage (%)
Clinical + Radiological	6	18%
GeneXpert MTB/RIF	26	76%
Smear Microscopy	1	3%
Clinical Diagnosis Only	1	3%
Total	***34***	***100%***

Among the 34 TB cases, 26 (76%) were diagnosed bacteriologically using gene Xpert

Treatment Outcome

Outcome	Number of Children	Percentage (%)
Cured	18	40%
Completed Treatment	10	42%
Lost to Follow-Up	2	6%
Died	2	6%
Ongoing Treatment	2	6%
Total	***34***	***100%***

Among the 34 TB cases, treatment success rate (combining cured and completed treatment) was 82%, while 6% were lost to follow-up and 6% died during treatment.

EP05-747-18 Predictors of paediatric TB disease in a pastoralist community, Turkana County, Kenya: A case-control study

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Background: Tuberculosis (TB) remains a significant global public health challenge, with 10 million cases and 1.6 million deaths reported in 2021. Children accounted for 11% of these cases and deaths. In Kenya, about 77,000 TB cases were reported, with pediatric TB making up 9.6% of cases and 4.8% of TB-related deaths. Turkana County, a predominantly pastoralist region, contributed to 19% of Kenya's pediatric TB burden. However, the specific drivers of high pediatric TB rates in this region remain unclear. This study aimed to identify predictors of pediatric TB in Turkana West Subcounty.
Design/Methods: An unmatched case-control study was conducted among children aged 0–14 years from January to May 2023. We randomly selected 106 pediatric TB cases from health facilities and enrolled 212 neighborhood controls. Data were collected using structured questionnaires covering socio-demographic, clinical, behavioral, and socioeconomic factors. Bivariate and multivariate logistic regression analyses were used to identify predictors of pediatric TB.
Results: Among 318 participants, 47% were male and 53% female, with a mean age of 5 years for cases and 6 years for controls. Children with a household TB contact in the past year had significantly increased odds of TB (aOR=21.09; 95% CI: 7.86–56.59). Previous hospital admission was also a significant predictor (aOR=3.26; 95% CI: 1.30–8.24). Caregiver alcohol use was strongly associated with TB (aOR=6.50; 95% CI: 2.41–17.53), while caregiver knowledge of TB prevention was protective (aOR=0.04; 95% CI: 0.01–0.12).
Conclusions: Pediatric TB in Turkana West is strongly linked to household TB exposure, hospital admissions, caregiver alcohol use, and lack of TB prevention knowledge. Targeted interventions focusing on caregiver education, improved healthcare access, and infection control can reduce pediatric TB burden in similar pastoralist settings.

EP05-748-18 Performance of the Fujifilm SILVAMP TB LAM II (FujiLAM II) assay in diagnosing childhood TB

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Background: Non-sputum tuberculosis (TB) diagnostics are urgently needed to improve childhood TB diagnosis, as current methods rely on sputum, which is difficult to obtain from children. This study evaluated the Fujifilm SILVAMP TB LAM II (FujiLAM II) for diagnosing TB in children.
Design/Methods: Children with TB (confirmed by GeneXpert Ultra MTB/RIF [Xpert Ultra] or clinically diagnosed) and healthy controls were recruited from hospitals and primary schools, respectively. Spot urine samples were tested using FujiLAM II. Sensitivity was assessed against a composite reference standard, Xpert Ultra results, and clinical diagnoses, while specificity was determined using healthy controls. FujiLAM II was compared to Xpert Ultra using McNemar's test. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to evaluate sensitivity in key subgroups (HIV-coinfected, malnourished, and children under 5 years).
Results: Of 123 participants, 73 (59.3%) had TB (18 bacteriologically confirmed, 55 clinically diagnosed), and 50 (40.7%) were healthy controls. FujiLAM II showed an overall sensitivity of 19.7%, higher in confirmed cases (38.9%) than clinically diagnosed (13.2%). Sensitivity

varied by TB type: disseminated TB (30.8%), pulmonary TB (23.7%), and extrapulmonary TB (5.0%). Higher sensitivity was observed in children under 5 years (30.8%) vs. those above 5 (6.2%) (adjusted OR = 6.01; 95% CI: 1.20–30.09; p = 0.029), HIV-positive children (28.6%) vs. HIV-negative (19.4%) ($p > 0.05$), and malnourished children (26.8%) vs. those with normal growth (10.7%) ($p > 0.05$). Specificity was 100%. In children tested with both Xpert Ultra and FujiLAM II, sensitivity differences were not significant (34% vs. 26.4%; $p > 0.05$). Combining FujiLAM II with Xpert Ultra (positive if either test was positive) improved sensitivity to 47.2%.

Conclusions: FujiLAM II's child-friendly, rapid point-of-care approach shows promise for childhood TB diagnosis, particularly in children under 5 years, HIV-coinfected, or malnourished. With high specificity, it could serve as a valuable adjunct test.

EP06 Pregnancy: M. tuberculosis infection, TB diagnosis and treatment

EP06-749-18 Effect of gestational diabetes on interferon-gamma responses among pregnant women in India: Results of the PraGaTHi study

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Background: HIV and diabetes mellitus (DM) are independent risk factors for Tuberculosis (TB) in non-pregnant populations. The effect of gestational DM (GDM) on TB immunology, particularly in women with HIV, is unclear.

Our previous work reported lower TB-specific immune responses in women with GDM, particularly in women with HIV on efavirenz-based antiretroviral therapy (ART). We sought to reassess this association with Dolutegravir-based ART.

Design/Methods: In the PraGaTHi study, pregnant women are screened for GDM using an oral glucose tolerance test (WHO 2013 cutoffs) and for TB Infection (TBI) using QuantiFERON-plus.

Among women with TBI, IFN-γ levels from TB1 and TB2 supernatant were compared between women with and without GDM. Linear regression models, adjusted for age, socioeconomic status, HIV, and Body mass index (BMI) assessed the impact of GDM on IFN-γ levels.

Results: Of the 109 (27%) enrolled women with TBI,35 (32%) had GDM, 25 (23%) had HIV, median age was 27 years (IQR 23.0 – 29.0) and median gestational age 20.4 years (IQR 16 - 23.6).

Women with TBI and GDM were older (28 vs 25.5 years, p=0.04), had higher median weight (69 vs 51 kg, p <0.001), BMI (28.9 vs 21.8, p <0.001) and were more likely to be multigravida (89% vs 70%, p 0.04), and HIV-negative (94% vs 69%, p=0.003) compared to women with TBI without GDM. GDM did not significantly affect IFN-γ in TB1 (0.78 vs 1.07, p >0.9) or TB2 (1.40 vs 1.58, p 0.5) tubes.

However, linear regression showed a trend of lower IFN-γ levels in women with GDM (p=0.1) (Figure 1).

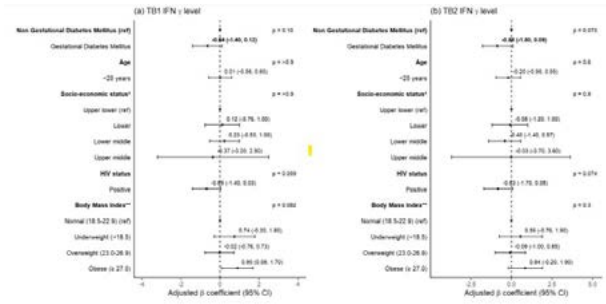

Figure 1: The association between Gestational Diabetes Mellitus and Tuberculosis (TB)1 (a) and TB2 (b) interferon-gamma (IFN-γ) levels among pregnant women with latent TB infection enrolled in Pune, India. Linear regression models adjusted for age, socio-economic status (SES), HIV status, and Body Mass Index (BMI) (ref, reference category). *SES categorised per modified Kuppuswamy scale; **WHO BMI categories for Asians.

Conclusions: Contrary to our previous findings, GDM did not significantly affect IFN-γ levels during pregnancy, regardless of HIV status, although a trend for lower levels was observed. Longitudinal studies will help determine whether GDM is a risk factor for maternal TB.

EP06-750-18 A multicentre, hospital-based survey of TB after in vitro fertilisation in China

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Background: In vitro fertilization (IVF) is increasingly popular for treating infertility. However, in regions with high tuberculosis prevalence, there are reports of fatal infections in tuberculosis patients who become pregnant through IVF, though clinical evidence remains limited.
Design/Methods: To systematically assess data on tuberculosis during pregnancy from multiple centers and clarify the association between the mode of conception and clinical outcomes, we retrospectively reviewed the conception mode and clinical information of pregnant tuberculosis patients using a multi-center medical electronic information system.
We investigated tuberculosis outcomes and fetal outcomes. The primary endpoints were the rate of critically ill maternal conditions post-tuberculosis development and maternal mortality within six months of treatment initiation.
Results: The study included 401 cases of tuberculosis during pregnancy from five infectious disease centers in China (2014-2023). Among these, 90 cases involved IVF, and 311 did not. Of the cases, 56% were bacteriologically confirmed, 44% were clinically diagnosed with negative bacteriological results, 97% had positive IGRA/TST results, and 1% were MDR/RR-TB.
The IVF group had a significantly higher proportion of critically ill cases (38% vs 13%, adjusted odds ratio [aOR]=5.8, P<0.001), with more severe complications such as hematogenous disseminated tuberculosis (86% vs 7%, P<0.001) and tuberculous meningitis (29% vs 6%, P<0.001), and worse fetal outcomes (miscarriage rate 24% vs 7%, P<0.001). There was no significant difference in maternal mortality between the IVF and non-IVF groups (2.2% vs 1.0%, P=0.684).
Conclusions: This study confirms that women who conceive through IVF are more susceptible to severe tuberculosis and experience worse perinatal outcomes. Therefore, it is essential to implement tuberculosis infection screening and prevention measures before undergoing IVF treatment.

EP06-751-18 Integrated TB screening in pregnant women during ANC: A study on early detection, TB treatment and pregnancy outcomes from rural India

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Background and challenges to implementation: Pregnant women (PW) are disproportionately vulnerable to TB. Due to limited access to non-Maternal and Neonatal Health services, including chest X-rays, TB often goes undiagnosed and untreated in this population. We studied the pregnancy and TB treatment outcomes of pregnant women who were screened, diagnosed, and treated for TB during their antenatal care (ANC), with the support of healthcare workers.
Intervention or response: We conducted screening for TB symptoms in pregnant women, aged 18-45 years of age attending ANC clinics from April 2023- December 2024. We facilitated presumptive PW for diagnosis through sputum or stool specimen testing. We encouraged PW with confirmed or clinically diagnosed TB to initiate TB treatment through usual care.
Results/Impact: We screened 30,646 pregnant women, aged 18-45 years (median age 22), from Begusarai and Samastipur districts of Bihar. 725 were found presumptive and 452 were tested either by stool or sputum for TB. Median turn-around time between screening and diagnosis of TB is 8 days with a range 1-72 days. We diagnosed 64 PW with TB and 62 started TB treatment. 2 PW did not wish to start their TB treatment. 53 PW (82%) had bacteriologically confirmed TB, either from sputum (92%) or stool (8%) specimen testing. 52 (83%) PW were successfully treated (cure and complete) for TB, 6 are on

treatment, 3 were lost to follow up for various reasons, 1 regimen changed. The pregnancy outcomes included 56 full-term deliveries with healthy babies, 1 miscarriage, 1 abortion and 4 still in their gestation period.
Conclusions: To enhance maternal and neonatal health in vulnerable areas, intensive case finding in PW can be integrated with ANC. Educating Healthcare Workers on TB symptoms during pregnancy and conducting early screening can facilitate timely diagnosis and treatment, and encourage institutional delivery. Respect for the women's choice towards decisions on treatment is crucial for acceptance.

EP06-752-18 Improving TB detection among pregnant women through community-based integrated TB/HIV screening in Southeast Nigeria: Early implementation results

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Background and challenges to implementation: In many high TB burden settings, tuberculosis (TB) screening among pregnant women is often overlooked, resulting in missed diagnoses and contributing to adverse maternal and neonatal outcomes. Despite being a high-risk group, pregnant women are rarely included in routine active case-finding initiatives, partly due to low clinical suspicion and limited integration of TB screening within maternal health services. This study assesses the preliminary outcomes of a community-based intervention that integrates TB and HIV screening for pregnant women in Southeast Nigeria
Intervention or response: As part of the Global Fund TB/HIV Project, an integrated community-based screening initiative was conducted from January to December 2024 across Enugu, Ebonyi, Imo, and Abia States in southeastern Nigeria. The aim was to enhance TB and HIV case detection among pregnant women.
The intervention trained 370 Community Volunteers (CVs) and 576 Traditional Birth Attendants (TBAs). CVs conducted house-to-house visits and community outreaches to screen for TB symptoms, conduct HIV testing, and refer PW to Antenatal Care (ANC) services. TBAs integrated routine TB and HIV screening into their maternal care services at TBA facilities, embedding TB/HIV interventions within existing maternal health platforms.
Results/Impact: Over 12-month implementation period (January to December 2024), a total of 39,209 pregnant women were screened. 3,328 (9%) identified as presumptive TB cases, 13 TB cases diagnosed through molecular testing.11 pregnant women (85%) were initiated on treatment. A key implementation challenge was treatment hesitancy, with some pregnant women expressing fear that anti-TB medications might harm their unborn children, resulting in delays in treatment initiation.

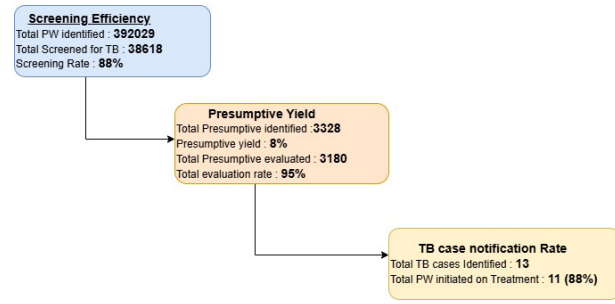

Figure. Result from TB screening of pregnant women (PW) January 2024 to December 2024.

Conclusions: Community-based integrated TB/HIV screening is an effective strategy for enhancing TB case detection among pregnant women in high-burden, low-access settings. However, to maximize uptake and ensure timely treatment, the model must incorporate targeted counseling interventions to address maternal concerns and promote confidence in TB treatment safety during pregnancy.

EP06-753-18 The effectiveness of integrating prevention of mother-to-child transmission (PMTCT) and TB screening services in Abia State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB), an infectious disease primarily affecting the lungs, poses a significant public health challenge, particularly in pregnant women who may also be at risk for HIV. Prevention of mother-to-child transmission (PMTCT) programs are designed to reduce the transmission of HIV from an HIV-positive mother to her child.
This study investigates the impact of integrating TB screening within PMTCT services in Abia State, Nigeria, focusing on improving TB case detection, enhancing maternal health outcomes, and addressing the intersection of TB and HIV.
Intervention or response: Descriptive statistics were conducted on data abstracted from community health records collected between July and December 2024. A total of 7,135 pregnant women were screened for TB, and 5,945 were tested for HIV. We used Microsoft excel to analyze the effectiveness of the integrated service delivery on TB case detection and subsequent treatment.
Results/Impact: Integration of TB screening into PMTCT services led to a significant increase in TB case detection among pregnant women. Among the 7,135 women screened for TB, 442 (6.2%) were identified as presumptive TB cases, sputum samples were collected for GeneXpert testing, and 6 (0.08%) were confirmed to have TB and initiated treatment.
In addition, 5,945 pregnant women were tested for HIV, with 81 (1.4%) testing positive and promptly enrolled in care. The integration of TB and HIV screening facilitated timely diagnosis and immediate linkage to treatment, ultimately improving health outcomes for both mothers and infants.
Conclusions: The integration of TB screening within PMTCT services significantly enhances TB and HIV case detection, enabling early diagnosis and timely treatment initiation. This approach strengthens maternal healthcare services and plays a pivotal role in reducing the burden of TB and HIV co-infection among pregnant women, ultimately improving health outcomes for both mothers and their infants.

EP06-754-18 Traditional birth attendants: Key allies in the fight against TB in hard-to-reach areas in Oyo State, Nigeria

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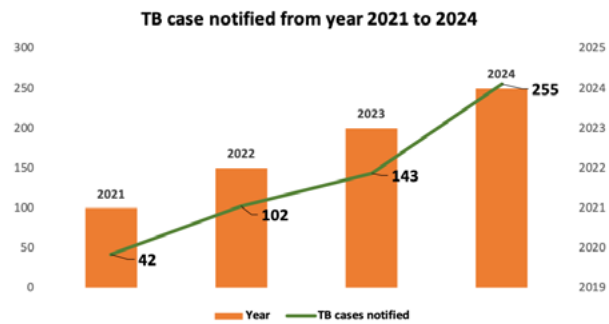
Background and challenges to implementation: Traditional Birth Attendants (TBAs) remain key healthcare providers in rural areas, particularly in hard-to-reach communities. They serve as the first point of care for vulnerable groups, especially pregnant women, due to their accessibility, affordability, and cultural acceptance. With an estimated 62% of births occurring outside health facilities, TBAs play a crucial role in bridging healthcare gaps. In Oyo State, tuberculosis (TB) case notification had a 34% gap in 2021, highlighting the need for innovative interventions. This study explores the impact of engaging TBAs in TB service delivery, especially in rural areas.
Intervention or response: A total of 250 TBAs across five local government areas (LGAs) were trained and engaged to conduct TB symptomatic screening. Identified presumptive TB cases were referred for GeneXpert or Truenat testing, with chest X-rays conducted for those unable to produce sputum. TBAs received quarterly refresher training and financial incentives based on successful case referrals and treatment initiation. Each TBA used a standardised TB screening tool from the National Tuberculosis Programme, with data compiled by assigned Linkage Coordinators.



Results/Impact: From Q1 to Q4 2024, 14,209 individuals visited TBAs, of which 14,195 were screened for TB. This led to 2,221 presumptive TB cases (15.6%), all referred for laboratory evaluation. 255 TB cases (10.1%) were

confirmed, including 180 via GenXpert and 75 via chest X-ray. Additionally, 21 childhood TB cases (8.2%) were identified. TB cases identified through TBAs accounted for 5% of Oyo State's total TB cases in 2024, emphasising their role in early detection and referral.
Conclusions: Engaging TBAs in active TB case finding is vital for identifying missing TB cases, particularly in underserved communities. Strengthening collaborations between orthodox and alternative care providers enhances early TB detection and control.

EP06-755-18 Assessing blood-based TB transcriptomic gene signatures in pregnant women with bacteriologically confirmed and non-confirmed TB

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Background: Tuberculosis (TB) is one of the leading causes of death in women of reproductive age.Widely available diagnostic tools often lack efficacy in pregnat women thereby resulting in missed diagnoses and leading to the death. Blood transcriptomic signatures have shown promise for TB testing especially as an alternative test practicable in populations that cannot produce sputum or who have paucibacillary disease.
Design/Methods: We propose to perform a prospective study to screen TB in pregnant women with transcrimtomic and routine tests. HIV-negative pregnant women presenting TB pulmunary symptoms were recruited from 17 healthcare facilities in Antananarivo, Madagascar. For each participant sputum were collected for acid-fast smear microscopy and Loweinsten-Jensen culture to identify the participants as active TB (pATB) and non-active TB pregnant women (pNTB). Venous blood were collected with PaxGene blood tubes to have RNA and QuantiFERON Gold Plus tubes to assess the TB infection status. The TB-scores generated from two signature sets Sweeney-3 and RISK6 were measured using qPCR.
Results: From April 2018 to August 2019, 34/276 pregnant women had TB bacteriologically confirmed TB. Significantly lower and higher relative expression respectively for DUSP3 ($p<0.01$) and GBP5 ($p<0.0001$) were observed in pATB compared to pNTB. A low Sweeney-3 TB-score was observed in pATB compared to pNTB ($p<0.0001$). RISK6 score shows a significative difference between pATB and pNTB ($p<0.0001$). From the ROC curve analysis, an AUC performance of GBP5 (AUC=0.77; 95%CI: 0.62-0.93), Sweeney-3 TB score (AUC=0.71; 95%CI: 0.55-0.87) and DUSP3 (AUC=0.64; 95%CI: 0.49-0.79). GBP5-TB score showed the best combination with a sensitivity and specificity ranging around 75.0% to 77.0 %, respectively.
Conclusions: While the two TB-gene signature showed slight difference between pregnant women with active and non confirmed pulmonary TB. The two gene signatures did not met the WHO Target product profile for screening tests for TB in our population.

EP06-756-18 TB treatment outcomes and safety among pregnant women and their infants

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Background: Pregnant and lactating women have historically been excluded from the majority of clinical trials on tuberculosis (TB) therapeutics, resulting in a lack of knowledge on the use of TB medicines for this population. We conducted a systematic review to evaluate TB treatment outcomes and safety for pregnant women.
Design/Methods: We identified studies reporting original data on TB among pregnant, postpartum, and/or lactating women published from January 2000–September 2024. We abstracted and pooled data to assess TB treatment outcomes (favorable vs. unfavorable); risk of adverse maternal outcomes (*e.g.,* death, pre-eclampsia, eclampsia); and risk of adverse fetal and neonatal outcomes (*e.g.,* preterm birth, low birthweight, TB, death) among pregnant women receiving TB treatment. We stratified analyses by country-level TB incidence and TB drug-susceptibility.
Results: In 22 studies reporting data on TB treatment outcomes, the pooled proportion with favorable outcomes was 79% (range 35%-100%) for drug-susceptible TB and 68% (range 49%-100%) for MDR/RR-TB. Unfavorable treatment outcomes were more common in high TB incidence settings.
In studies reporting data on maternal outcomes among pregnant women with TB (n=38), pooled mortality was 7.4% (range 0%-29%) for drug-susceptible TB and 8.2% for MDR/RR-TB (range 0%-13%) in high TB incidence settings. Incidence of pre-eclampsia ranged from 3.5%-8.9% and eclampsia from 0.7%-5.2%. In studies reporting data on fetal and neonatal outcomes (n=39), pooled incidence of stillbirth was 3.4% (range 0%-9.6%), preterm

birth was 32% (range 3.7%-70%), low birthweight was 35% (range 14%-64%), infant TB was 8% (range 0%-16%), and infant mortality was 6% (range 0%-9%) for drug-susceptible TB in high TB incidence settings (Table).

Outcome (number of studies included)	Pooled Proportion (Range)
IUD/Stillbirth (n=10)	3.4% (0% to 9.6%)
Spontaneous abortion (n=9)	4.1% (0% to 12.9%)
Preterm birth (n=11)	31.7% (3.7% to 70.0%)
Low birthweight (n=9)	35.4% (13.7% to 63.6%)
Small for gestational age (n=5)	28.3% (11.1% to 43.2%)
Infant TB (n=6)	8.0% (0% to 15.8%)
Infant death (n=4)	5.9% (0% to 8.6%)

Table. Adverse Neonatal and Infant Outcomes among Pregnant Women in Medium (100-300 cases per 100,000) or High (>300 cases per 100,000) TB Incidence Settings.

Conclusions: TB treatment outcomes varied widely among pregnant women, and TB in pregnancy was associated with a high risk of adverse fetal and neonatal outcomes, including preterm birth, low birthweight, and infant mortality. Adverse outcomes were most pronounced in settings with high TB incidence.

EP06-757-18 Rifampicin-resistant TB in pregnant and breastfeeding women: A review of national guidelines across high-burden countries

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Background: Pregnant and lactating women (PLW) have historically been excluded from tuberculosis (TB) treatment trials, leading to a lack of evidence-based guidelines for managing rifampicin-resistant TB (RR-TB) in these populations.
Despite recent advancements in TB treatment regimens, including newer all-oral, shorter-course options, PLW continue to receive prolonged and potentially more toxic treatments.
This study reviews national RR-TB guidelines across the high-burden RR-TB countries to assess the inclusion of specific recommendations for PLW, including guidance on diagnosis, treatment, monitoring, and breastfeeding.

Design/Methods: We conducted a policy review of national RR-TB guidelines in WHO's 30 high-burden RR-TB countries using systematic internet searches and outreach to key stakeholders. Data were extracted using a standardized form assessing screening, diagnosis, treatment regimens, clinical monitoring, and breastfeeding recommendations. Descriptive statistics were used to summarize findings.
Results: Among the 29 countries with available guidelines, all included at least one policy recommendation related to RR-TB in PLW. Only 52% specified a treatment regimen for pregnancy, while 38% provided guidance on individual drug safety. While 24% allowed the use of a 9-month all-oral regimen, an equal proportion explicitly prohibited it. Only 3% recommended or did not prohibit the use of the newer BPaL(M) regimen. Clinical monitoring recommendations were included in 28% of guidelines, with a minority specifying specialist involvement. Regarding transmission prevention to infants, 79% recommended continued breastfeeding using a mask. 11% of countries recommended postpartum separation under certain circumstances.

Recommendation:	N (%)
Specific RR-TB regimen recommended in pregnancy	15(52%)
No regimen specified, but drugs recommended	11 (38%)
No guidance provided	3 (10%)
9-month regimen	
Allowed	7 (24%)
Not allowed	7 (24%)
Do not specify duration of regimen	15 (52%)
BPaL/BPaLM	
Recommended	1 (3%)
Not prohibited	1 (3%)
Not recommended	9 (31%)
Delayed treatment start until 2nd trimester	11 (38%)
Pregnancy termination recommended (<20 weeks)	1 (3%)

Table 1. RR-TB treatment regimen recommended during pregnancy and lactation.

Conclusions: While high-burden RR-TB countries provide some guidance on TB management in pregnancy, there is substantial variability and inconsistency in recommendations. The limited inclusion of newer treatment regimens and inconsistencies in monitoring and breastfeeding guidance highlight an urgent need for more robust, standardized recommendations to ensure optimal care for PLW with RR-TB. Future research should prioritize the inclusion of PLW in clinical trials to generate evidence-based treatment guidelines.

EP06-758-18 Pharmacokinetics and safety of clofazimine in women treated for rifampicin-resistant TB during pregnancy and the postpartum period

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Background: Clofazimine undergoes phase I liver metabolism by CYP1A2 and CYP3A4/A5, with phase II metabolism via UDP-glucuronosyltransferase enzyme systems. There are no published data on clofazimine pharmacokinetics during pregnancy, and safety data are limited.
We present pharmacokinetic and safety data from pregnant and postpartum women receiving clofazimine for treatment of rifampicin-resistant tuberculosis (RR-TB) in routine care in South Africa.
Design/Methods: This was a non-randomised, open-label, multicentre study to assess the pharmacokinetic properties of antiretroviral and related drugs during pregnancy and postpartum. Between 2017 and 2019, pregnant women receiving ≥2 second-line antituberculosis drugs in routine care were included. Participants were enrolled in the second or third trimester and had visits with intensive pharmacokinetic sampling at least once during pregnancy, and at 2-8 weeks postpartum. Pharmacokinetic parameters were estimated using non-compartmental methods and compared antepartum to postpartum (within participant) using geometric mean ratios (GMR) with 90% confidence intervals (CIs) and the Wilcoxon Signed-Rank Test for paired data.
Results: Eleven pregnant participants from South Africa, seven (65%) with HIV, were receiving clofazimine (100 mg daily) at enrolment, of which nine (82%) received clofazimine for >8 weeks prior to pharmacokinetic evaluation. Nine (82%) of the 11 women continued treatment postpartum. Peak plasma concentrations and area-under-the-concentration-time-curve exposures were higher in the third than the second trimester, but these exposures in the postpartum period were considerably lower than in pregnancy (Figure 1). Seven (64%) women and eight (73%) infants experienced severe adverse events during maternal RR-TB treatment, more likely related to co-morbidities and multidrug regimens than to clofazimine alone.
Conclusions: Clofazimine exposures during pregnancy were within the range previously reported among non-pregnant adult women receiving treatment for rifampicin-resistant tuberculosis. Maternal exposures in the two months after delivery were lower than during pregnancy, possibly due to hormonal changes and the effect on enzyme regulation and drug metabolism.

EP07 Measuring what matters: Prevalance, adherence and the human dimensions of TB care

EP07-759-18 Prevalence and trend of tuberculosis cases in tribal-dominated districts in India: A time series analysis

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Background: Tuberculosis remains the leading cause of death globally from a single infectious agent. India bears the highest TB burden, accounting for 27% of global cases. Despite this burden, limited research exists on TB prevalence among India's scheduled tribe population (104 Million), who have poor access to healthcare and are especially vulnerable due to social determinants such as poor malnutrition.
This study analyses the prevalence and trends in notified TB cases across tribal-dominated districts of India from 2021-2024.
Design/Methods: Quarterly data on TB notifications were extracted from Ni-kshay repository for the period January 2021 to December 2024 across Indian districts where scheduled tribe population exceeds 50%. A total of 90 such districts were identified, and TB notifications were aggregated by quarter. A seasonality index was computed to examine temporal variation, and trends were analysed using linear regression. The average annualized case notification rate (2021–2024) was calculated for each district to estimate prevalence, which was then mapped by state.
Results: Quarterly analysis of TB cases in 90 tribal-dominated districts showed seasonal variation, with highest notifications in the third quarter (index 1.08), suggesting a possible influence of climatic or socio-behavioural factors on TB reporting trends. A linear trend from 2021–2024 indicated a rising trajectory. The average ACNR was 144.63 per 100,000, significantly higher than the national average of 113 ($p < 0.05$). High-prevalence clusters were observed in 3 states, highlighting the need for targeted interventions.
Conclusions: While the analysis reveals seasonal and increasing trends in notified TB cases in tribal districts, it remains unclear whether these reflect true incidence patterns or seasonal shifts in healthcare access and reporting. This underscores urgent need for community-engaged research to investigate underlying socio-economic drivers and guide effective, context-specific responses.
Current top-down strategies risk missing large segments of vulnerable populations, necessitating more inclusive, participatory, and locally informed interventions.

EP07-760-18 Demographic and immunological patterns in tuberculosis infection: Insights from a hospital cohort of over 14,000 QFT-tested patients

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Background: Tuberculosis infection (TBI) has been associated with chronic low-grade immune activation, a potential contributor to long-term health outcomes beyond tuberculosis. As part of a broader study investigating the link between TBI-driven immune activity and cardiovascular risk, we began by analysing the hospital's QuantiFERON-TB Gold (QFT) test database as an initial exploratory step. This analysis focused on patient-level interpretation of QFT results to identify demographic and clinical patterns relevant to persistent immune activation.
Design/Methods: We analysed 48,341 QFT test records performed in adults at a tertiary hospital between 2010 and 2023. After data cleaning and harmonisation, we include records with valid qualitative results and corresponding quantitative interferon-gamma values (Nil and antigen tubes). The final dataset included 14,342 unique patients. We described QFT positivity rates and explored associations with age, sex, and requesting clinical service. Nil tube values were analysed as a proxy for baseline immune activation.
Results: QFT was positive in 19.3% of cases, more frequently in men (22.8%) than women (15.6%). Positivity rose from 17% in ages 18–30 to 24% in those over 70. Highest positivity rates were observed in requests from

TB control, Infectious Diseases. Nil IFN-γ levels were higher in QFT-positive individuals (~0.5 IU/mL) than in negatives (~0.1 IU/mL; $p < 0.001$). Young men showed higher baseline IFN-γ than young women of the same age, a difference that waned over time (*Figure 1*).

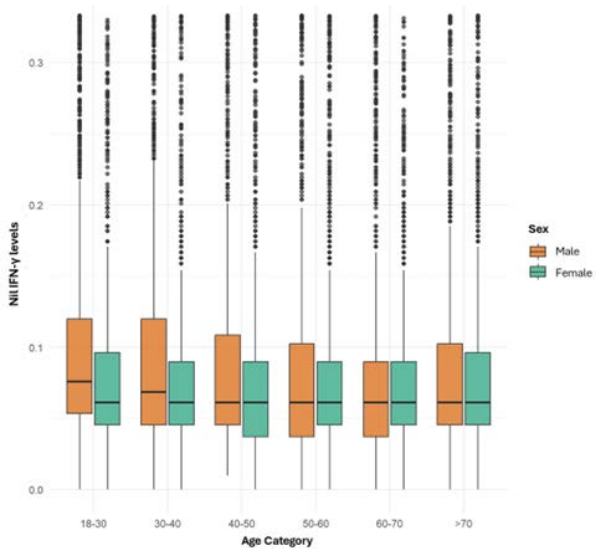

Figure 1. Baseline interferon-gamma levels (Nil tube) by age group and sex.

Conclusions: This large-scale hospital-based analysis supports the hypothesis that TBI contributes to persistent immune activation. The sex and age differences observed in IFN-γ levels may reflect variability in exposure to *Mycobacterium tuberculosis*, particularly in young men. These findings represent a profile of TBI in low incidence country and confirm progress toward understanding the long-term impact of TBI on cardiovascular health.

EP07-761-18 Sex stratified tuberculosis prevalence in low- and middle-income countries: Systematic review and meta-analysis

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Background: Men are at greater risk of tuberculosis (TB), have poorer access to care, and have worse TB outcomes than women in low- and middle-income countries (LMICs). We systematically identified survey-based sex-stratified estimates of TB prevalence in LMICs to investigate differences in TB prevalence by sex, and how this has changed over time.

Design/Methods: We searched multiple databases for publications which reported sex-stratified estimates of TB prevalence in LMICs and published between December 1, 2015, and February 29, 2024. We also included relevant surveys from a previous review, extending our study period to 2000–2024.

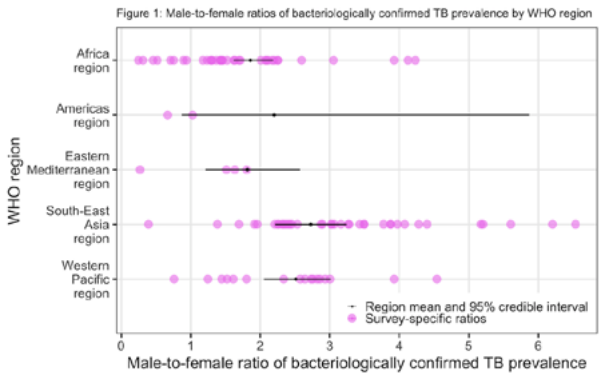
We fit multi-level Bayesian regression models to estimate TB prevalence for men and women, accounting for country- and survey-level random effects. We also estimated variation across World Health Organization (WHO) regions and annually.

Results: We screened 5,650 publications, reviewed full-text of 201 studies, and included 99 unique TB prevalence surveys (>4 million participants, 33 unique countries in five WHO regions) that reported sex-stratified bacteriological-confirmed TB prevalence in analysis.

Overall, TB prevalence was 444 [95% credible interval: 344, 605] per 100,000 among men and 201 [151, 278] per 100,000 among women, with a male-to-female prevalence ratio of 2.2 [1.9, 2.5].

All included WHO regions were estimated to have male-to-female prevalence ratios greater than 1.0–South-East Asia: 2.7 [2.2, 3.2], Western Pacific: 2.5 [2.1, 3.0], Americas: 2.4 [0.8, 5.5], Africa: 1.9 [1.6, 2.2], and Eastern Mediterranean: 1.8 [1.2, 2.6] (Figure 1).

Between 1994 and 2021, the male-to-female prevalence ratio increased with estimated male-to-female prevalence ratios of 1.9 [0.5, 5.1] in 1994 and 2.7 [1.4, 4.7] in 2021.



Conclusions: In LMICs, TB prevalence is substantially higher among men than women, with disparity likely widening. Understanding the individual, social, and health system determinants of this persistent gender differential is essential to maintaining an equitable path toward TB elimination.

EP07-762-18 Tuberculosis in prisons in Eastern Europe and Central Asia: A scoping review of prevention, diagnosis, and treatment interventions

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Background: Tuberculosis (TB) remains a major public health concern in prison systems across Eastern Europe and Central Asia (EECA), with prisons acting as amplifiers of TB transmission and drug resistance. Understanding TB care delivery across the criminal justice continuum is essential for improving health outcomes for incarcerated and recently released individuals.
Design/Methods: This scoping review maps evidence from original research studies published from 2010 to 2025 on TB interventions across the care cascade: TB preventive treatment (TPT), active case finding (ACF), diagnosis, and treatment.
The studies included were published in English or Russian and focused on incarcerated or previously incarcerated individuals in EECA countries. Databases searched included PubMed, Embase, and Web of Science. This care cascade was aligned with stages of the criminal justice continuum.
Results: We screened 206 articles, conducted full-text reviews for 103, and included 20. Most TB interventions were concentrated during incarceration. At intake, 7 studies reported symptom-based screening, but no other algorithms were described. During incarceration, 8 studies described periodic symptom-based screening, 3 had Xpert MTB/RIF and drug-susceptibility testing available onsite, and 13 reported offering treatment free of cost. Exit screening prior to release was rarely reported; only one study mentioned a small-scale intervention with no cases identified. Evidence was scarce for interventions after re-entry: only 1 paper discussed ACF, highlighting gaps in continuity of care. No study mentioned offering TPT to incarcerated or previously incarcerated people.

Table. TB interventions at each step of the TB care cascade available at each step of the criminal justice continuum in Eastern Europe and Central Asia*

	TB care cascade			
Criminal Justice Continuum	TB Preventive Treatment	Active case finding	Diagnostics	Anti-TB Treatment
During intake	None	Symptom-based screening n=7 papers	None	None
While incarcerated	None	Periodic symptom-based screening n=8 papers Annual (n= 3), bi-annual (n= 1), no frequency specified (n= 4)	On-site testing n=3 papers Xpert MTB/RIF (n=2), DST using MGIT and MTBDRplus (n=1)	On-site treatment (free of cost) n=13 papers
Prior to re-entry into community	None	Symptom-based screening n=1 paper	None	None
After re-entry into community	None	Symptom-based screening + incentives for sputum collection n=1 paper	None	None

*Data is summarized from 20 unique papers. Some papers described interventions at multiple care cascade steps.

Conclusions: While diagnostic and treatment interventions exist within prison walls, TB prevention and post-release continuity of care remain critically under-reported in the EECA region. Further research is needed on interventions that close these gaps, including expanding preventive therapy, standardizing exit screenings, and strengthening reintegration support. Improving linkage between penitentiary TB services and civilian health systems is essential to ensure that individuals released from incarceration can continue and complete their TB treatment without interruption.

EP07-763-18 Delays in uptake of global guidance for treatment of drug-susceptible tuberculosis case of Perú

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Background and challenges to implementation: Peru continues to struggle against TB, with the second-highest tuberculosis (TB) burden in the Americas. Innovations in TB treatment could improve the TB situation. The World Health Organization (WHO) has endorsed significant advances in updated guidelines, issued three times since 2010, with the latest update in 2022. We explored if Peru has integrated innovations from 2010 to 2023.

#	Summary of WHO recommendation	WHO (2010)	MINSA (2013)	WHO (2017)	MINSA (2018)**	WHO (2022)	MINSA (2023)
1	New patients with pulmonary TB should receive a regimen containing 6 months of rifampicin: 2HRZE/4HR	Strong recommendation High certainty of evidence	Agrees	Strong recommendation High certainty of evidence	Agrees	Strong recommendation High certainty of evidence	Agrees
2	Wherever feasible, the optimal dosing frequency for new patients with pulmonary TB is daily throughout the course of therapy	Strong recommendation High certainty of evidence	Does not agree	Strong recommendation High certainty of evidence	Does not agree	Strong recommendation High certainty of evidence	Does not agree
3	New patients with pulmonary TB may receive a daily intensive phase followed by a three-times weekly continuation phase [2HRZE/4(HR)3], provided that each dose is directly observed.	Conditional recommendation Moderate certainty of evidence	Agrees[&]	Withdrawn	Does not agree (retained)	Withdrawn	Does not agree (retained)
	3.1. New patients with pulmonary TB may receive a daily intensive phase followed by a three-times weekly continuation phase [2HRZE/4(HR)3], provided that each dose is directly observed in an HIV-prevalent setting	Conditional recommendation Moderate certainty of evidence	Agrees[&]	Withdrawn	Does not agree (retained)	Withdrawn	Agrees (withdrawn)
4	In all patients with drug-susceptible pulmonary TB, the use of thrice-weekly dosing is not recommended in both the intensive and continuation phases of therapy, and daily dosing remains the recommended dosing frequency	NA	NA	Conditional recommendation Very low certainty of evidence	Does not agree	Conditional recommendation Very low certainty of evidence	Does not agree
5	In new pulmonary TB patients treated with the regimen containing rifampicin throughout treatment, if a positive sputum smear is found at completion of the intensive phase, the extension of the intensive phase is not recommended	Strong recommendation High certainty of evidence	Does not agree	Strong recommendation High certainty of evidence	Does not agree	Strong recommendation High certainty of evidence	Does not agree
6	People aged 12 years or older with drug-susceptible pulmonary TB may receive a 4-month regimen of isoniazid, rifapentine, moxifloxacin and pyrazinamide (2HPMZ/2HPM)	NA	NA	NA	NA	Strong recommendation (new) Moderate certainty of evidence	Does not agree
	6.1. In children and adolescents between 3 months and 16 years of age with non-severe TB (without suspicion or evidence of MDR/RR-TB), a 4-month treatment regimen (2HRZ(E)/2HR) should be used	NA	NA	NA	NA	Strong recommendation (new) Moderate certainty of evidence	Does not agree
7	TB patients who are living with HIV should receive at least the same duration of daily TB treatment as HIV-negative TB patients.	Strong recommendation High certainty of evidence	Agrees*	Strong recommendation High certainty of evidence	Agrees*	Strong recommendation High certainty of evidence	Agrees
	7.1. ART should be started as soon as possible within two weeks of initiating TB treatment, regardless of CD4 cell count, among people living with HIV. Adults and adolescents / Children and infants.	NA	Agrees	Strong recommendation, low to moderate certainty of evidence: Adults / Adolescents. Very low certainty of evidence: Children and infants	Agrees	Strong recommendation, low to moderate certainty of evidence: Adults / Adolescents. Very low certainty of evidence: Children and infants	Agrees
8	In patients with tuberculous meningitis, an initial adjuvant corticosteroid therapy with dexamethasone or prednisolone tapered over 6–8 weeks[#] should be used.	NA	Preceded	Strong recommendation Moderate certainty of evidence	Agrees	Strong recommendation Moderate certainty of evidence	Agrees
	8.1. In patients with tuberculous pericarditis, an initial adjuvant corticosteroid therapy may be used.	NA	Preceded	Conditional recommendation Very low certainty of evidence	Agrees	Conditional recommendation Very low certainty of evidence	Agrees

* In Peru, the recommendation is for 9 months of daily treatment for HIV-coinfected, longer than the standard 6 months recommended for people not living with HIV.
** In 2018, parts of the Peruvian Norma were updated, but a full, new version was not reissued.
[&] It only applies the continuation phase in the Peruvian Norma.
[#] Different durations are recommended: 2-4 weeks in Peru and 6-8 weeks by WHO.
The recommendation: The use of fixed-dose combination (FDC) tablets is recommended [over separate drug formulations in the treatment of patients with drug-susceptible TB] was not included in the table due to format requirements, this recommendation was uptake by the Peruvian guideline since 2013.

EP07-763-18 Table.

Intervention or response: In this case study, we systematically compared each WHO recommendation to those contained in the contemporaneous guidance in Peru.
We categorize and report the number of concordant or non-concordant recommendations between those guidelines.
Results/Impact: Between 2010 and 2022, WHO issued 13 treatment recommendations for drug-sensitive TB (DS-TB), focusing on regimen composition, duration, formulation, administration frequency, adjustments for HIV-TB, and adjunctive therapies for extrapulmonary TB. Six of these recommendations are based on high-certainty evidence and remain in place.
By March 2023, Peru had adopted 6 of the 13 WHO recommendations. The country incorporated 67% of WHO's 2010 recommendations by 2013 and 67% of the 2017 guidelines by 2018. The two sets of guidelines align on regimen composition, particularly for people living with HIV, and on adjunctive therapies like antiretrovirals for HIV and corticosteroids for extrapulmonary TB, the latter adopted earlier by Peru than by WHO.
Conclusions: Our analysis shows that delays in adopting--or outright rejection of—the recommendations on duration could result in unnecessarily prolonged treatment, increased toxicity, significant inconvenience, and added burdens on the healthcare system.
Since 2010, more than 200,000 patients have been treated for TB in Peru under guidance that lags behind the global standard.
This is an ethical and public health failure. Systems for rapid review of emerging evidence and informed updates—and implementation—of guidance are critical to improve the quality of care for and reduce the burden of TB in Peru.

EP07-764-18 Integrated service delivery for tuberculosis: Assessing people-centeredness, sustainability, and effectiveness in wave 10 TB REACH interventions

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Background: Global health interventions have historically focused on disease-specific programs to combat urgent health threats like the HIV and TB pandemics. While effective in mobilizing rapid responses, these vertical approaches have been criticized for being fragmented, inefficient, and unsustainable. Amid the rising burden of non-communicable diseases (NCDs) and the ethical imperative to provide human-rights-based care, integrated, people-centered strategies are gaining prominence. In response, TB REACH prioritized Integrated Service Delivery (ISD) in its Wave 10 funding cycle, supporting projects that combined TB services with care for other conditions.
Design/Methods: This mixed-methods study aims to characterize and evaluate the diverse case finding ISD models in 19 projects with multiple interventions across 14 countries running between Q1 2023 and Q4 2024. Project reports, quantitative data, a survey, and interviews were analyzed across three key impact areas of ISD theory: people-centeredness, sustainability, and effectiveness in TB case finding.
Results: Preliminary findings reveal four main approaches to ISD in Wave 10 projects. Most projects integrated TB screening into multi-disease community outreach (12 projects) or into existing services within health facilities (10 projects), such as maternal health or diabetes clinics. Only three projects screened or referred people with TB for additional health needs. Interestingly, five projects offered combined screening for TB and another condition within facilities. Although integration mostly involved screening and diagnosis, some interventions also targeted steps further down the care cascade, such as treatment initiation and adherence. Key challenges included care linkage due to barriers in access and treatment availability for conditions other than TB.
Conclusions: Early findings suggest ISD may improve convenience and access for people seeking care, but requires careful planning not to over-burden the health system and to ensure full care delivery for all health conditions. Final conclusions will align with the ISD theoretical framework upon study completion.

EP07-765-18 Temporal complexity in non-adherence to anti-tuberculosis treatment, a prospective cohort study in Tanzania

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Background: Non-adherence to anti-tuberculosis (TB) regimens is not simplistic; rather, doses are missed in complex patterns. In a cohort of individuals being treated for rifampicin-sensitive pulmonary TB in Tanzania, we sought to examine the temporal complexity of how non-adherence changed across the treatment course and within a day, as well as the reasons for missed dose periods.
Design/Methods: 200 participants aged ≥18 years treated with the standard six-month regimen for drug sensitive TB were recruited March 2022-June 2023. Missed doses were measured using evriMED pillboxes and by pill count. Participant-declared reasons for up to three missed dose periods per month were collected. Patterns of missed doses- across treatment and within a day- and their reasons were visualised and described.
Results: Two participants died early in treatment, leaving 198 with missed dose data. Missed doses increased as time progressed. This was driven by early cessation of treatment (aka early discontinuation; median doses missed 0.0% in month 1 vs. 6.7% in month 6) from treatment, as opposed to doses missed sporadically (median doses missed 3.1% in month 1 vs. 4.1% in month 6). There was a median of one sporadic missed dose period (ranging between 0 and 42 doses in length) per participant. Out of all reported reasons for missed dose periods (Figure), 'forgot' or 'forgot and inconvenience' were the most common (59.6%).

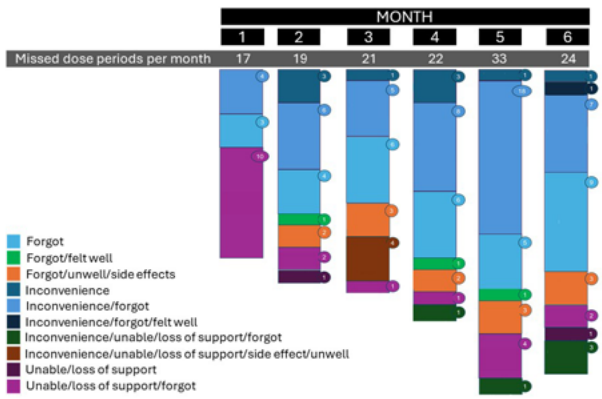

Figure. Reasons for missed doses across the treatment period.
The reasons for periods of missed doses (sporadic or early discontinuation) were reported for up to three missed dose periods per month by the participant. Numbers in circles/length of columns indicates the number of periods that occurred for that reason (or group of reasons) within a month. Multiple missed dose periods can be attributed to a participant in a particular month. If missed dose period spanned more than one month, it was reported across both months.

Conclusions: Non-adherence to anti-TB treatment is temporally complex, increases across the treatment course, and is the result of the intersection of multifaceted day-to-day events in an individual's life, with complicated implications for effective drug levels across the treatment course. This complexity substantially limits our ability to predict an individual's non-adherence at the start of treatment.
Joint first authors: Tuwabunze and Salim
Joint senior authors: Mpagama and Stagg

EP07-766-18 A comparison of adherence to tuberculosis treatment measured using self-report and urine testing amongst people with drug susceptible pulmonary tuberculosis (DSTB) in Johannesburg, South Africa

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Background: Reliable adherence monitoring is essential for effective TB treatment and assessing the effectiveness of adherence-enhancing interventions yet no gold standard for measuring adherence exists. This study compared self-reported adherence to objective urine-based testing and identified predictors of non-adherence in a South African TB cohort.
Design/Methods: This cross-sectional study included people with DSTB recruited into the TB Sequel cohort between 07/2017-09/2019 in Johannesburg, South Africa. Adherence was assessed using self-reported missed doses and isoniazid urine testing at Month 2 (M2) and Month 6 (M6) using Isoscreen™ kits (GFC Diagnostics. Concordance was assessed using Gwet's AC. Diagnostic accuracy metrics (sensitivity, specificity, predictive values) were calculated. Multivariable logistic regression identified factors associated with urine-confirmed non-adherence.
Results: From 359 participants recruited in Johannesburg, 186 participants were included in this study. Over half, 110/186(59%) participants were male.
Self-reported adherence, defined as not missing any doses since the last study visit was high (95%(175/185) at M2 and 91%(170/186) at M6). Urine testing using kits that detect isoniazid, with its presence serving as a proxy for adherence, revealed lower adherence: 93%(172/183) at M2 and 79%(145/183) at M6. Concordance be-

tween self-report and urinalysis was high using Gwet's AC:0.88(95%CI:0.82–0.93) at M2 declining slightly to 0.69(95%CI:0.6–0.77) at M6. Self-report compared with urinalysis as the gold standard showed strong sensitivity (93% and 78%) and PPV(>91%), but poor specificity (9% and 25%) and NPV(<10%), indicating limited ability to detect non-adherence. In an adjusted logistic regression analysis, males were less likely to be non-adherent (aOR:0.23;95%CI:0.08–0.63p=0.004). Age, alcohol, education level and being on ART were not significantly associated with non-adherence.

	Proportion non- adherent	OR (95% CI)	p-value	aOR* (95% CI)	p-value
Age categories					
18-29	16%(9/34)	Per category increase -0.011 (-0.35-0.33)	0.95	Per category increase 1.08 (0.65-1.79)	0.76
30-39	28%(21/74)				
40-49	24%(12/50)				
50+	29%(50/28)				
Gender					
Female	20%(22/110)	Reference-Female 0.43 (0.22-0.83)	0.012	Reference-Female 0.24 (0.089-0.64)	0.005
Male	37%(28/76)				
Alcohol Use					
Non-drinkers	21%(15/72)	Per level increase 0.31 (0.19-0.51)	0.37	Per level increase 1.47 (0.76-0.65)	0.249
Moderate drinkers	33%(26/79)				
Heavy drinkers	26%(9/35)				
Education Level					
Low (No school or primary)	32%(8/25)	Per Level increase 0.97 (0.48-2.04)	0.93	Per level increase 0.13 (0.33-1.07)	0.067
Medium (Secondary/Highschool or vocational training)	25%(38/150)				
High (University & Higher)	36%(4/11)				
On Antiretrovirals (ART)		Reference-No		Reference-No	
Yes	54% (62/116)	1.00	0.99	0.38	0.701
No	46% (54/116)	(0.44-2.31)		(0.33-2.12)	

*Adjusted for age, gender, alcohol use, education level and ART

Table 1. Demographic and clinical factors associated with urine confirmed non-adherence.

Conclusions: Self-reported adherence overestimates adherence and fails to identify those at risk of treatment failure. Integrating objective adherence measures into TB programs may improve monitoring, enable early intervention, and support more person-centred care for better TB outcomes.

EP07-767-18 A theory-driven evaluation of the acceptability of a complex DRTB/HIV adherence intervention in South Africa

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Background: Intervention acceptability is critical to uptake and scale-up. We evaluated acceptability in an ongoing randomized control trial (RCT) comparing the effectiveness of adherence strategies among people with DRTB-HIV.

Data collection and coding were guided by the theoretical framework of acceptability focusing on affective attitude, burden, ethicality, coherence, opportunity cost, perceived effectiveness, and self-efficacy,

Design/Methods: Between December 2023 to March 2025, in-depth interviews were conducted with 30 trial participants exposed to one of four study arms:

A. Enhanced standard of care (enhanced training and workflow);

B. Psychosocial support (A + individual counselling, support groups, transport assistance, trial reimbursement);

C. mHealth (A + electronic monitoring– Wisepill device, trial reimbursement), or;

D. Which includes all elements of A+ B+C).

Trained staff, multiple coders, and audit trails supported rigorous data collection, inter-rater reliability, and analytic confirmability.

Results: Participants were gender and age-diverse (16 females, median 36.5 years) and exposed to intervention A (n=6), B (n=7), C (n=9), or D (n=8). All reported that DRTB-HIV had disrupted their lives, arduous treatment, and increased dependency on others for emotional and material support. Stigma, income loss, and food scarcity were major concerns.

While they conveyed strong coherence and self-efficacy towards all interventions, specific components were differentially accepted (Table 1). (A): Short waiting times, staff compassion and respect, (B, D:) individual counselling, staff availability, peer support, and reimbursements (all arms) were considered the most valuable, least burdensome, ethically aligned, and confidence-bolstering. Affective attitudes toward psychosocial support (B, D), including staff relations (A), were strong.

Despite high coherence and self-efficacy toward mHealth (C), the device and follow-up calls were burdensome, diminishing acceptability. Innate treatment attributes, core to affective attitudes such as treatment length or job loss remained unaddressed.

Affective Attitude	Burden	Ethicality	Intervention Coherence	Opportunity Cost	Perceived Effectiveness	Self-Efficacy Effectiveness
How participants feel about the intervention	Amount of effort required to participate	Extent to which intervention good fit with individual values	Extent to which participant understands the intervention	Extent to which benefits, opportunities must be given up to participate	Extent to which intervention is likely to achieve its purpose	Confidence they can perform required behaviour
Motivated to complete treatment and	Disruption of everyday life (e.g. waking up to take meds)	Treated with respect, compassion and patience	Knowledge of the disease (DRTB), medication and side-effects	Loss of employment or work opportunities	Believe that they will be cured (DRTB)	Knows how to use the pillbox (understands dashboard)
Adherence being easier						
Appreciate the reimbursement and transport to the study site	Increased reliance on family and friends for support	Can depend on team/free to talk to staff	Study is to help people stay adherent, complete treatment, motivate, and learn about DRTB	Financial cost (travel, food)	The staff know what they are doing ("their things are straightforward")	Does not need reminders anymore, takes meds as instructed
Short waiting time	Carrying a pillbox (to visit or work)	Confidentiality (no label on pillbox)	Knows how to use the pillbox (understands dashboard)	Loss of relationships such as boy/girlfriend		Developed strategies to store/take meds (counts the pills)

Conclusions: Facility-level program enhancements and psychosocial support that align with patient values and ethics, imposed the least burdens and opportunity costs were most acceptable.

EP07-768-18 Digital DOTS's expansion for TB care in Brazilian municipalities: An operational analysis

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Background: Tuberculosis (TB) remains a major public health challenge, especially in developing countries. Treatment adherence is essential for TB control, and digital technologies, such as Video Directly Observed Therapy (VDOT), offers a promising, patient-centered alternative that may improve adherence, outcomes, and reduce costs. In 2023, Brazilian government recommended a protocol for digital health use in TB treatment, but did not establish a particular technology, allowing municipalities to choose based on local needs. This study aimed to evaluate VDOT implementation in Brazilian municipalities and identify key implementation constraints.

Design/Methods: The study is being conducted in municipalities in São Paulo state, chosen by epidemiological criteria, including high TB incidence and loss to follow-up rates. VDOT allows video recording of medication intake via an Android application, allowing asynchronous supervision by healthcare professionals. Questionnaires were administered to individuals undergoing TB treatment. A descriptive analysis of participant profiles was performed, along with characterization of municipalities and challenges in implementing VDOT.

Results: VDOT has already been implemented in 6 of the 30 municipalities selected. Regarding the participants (n=23), the majority were male (73.9%), aged between 30 and 59 years (65.2%), self-identified as "pardo" (mixed race) (56.5%), had incomplete primary education (43.5%), worked in informal employment (30.4%) and earned less than the minimum wage (34.8%). The main constraints to expanding VDOT usage identified included management and professionals' changes due the election period, which delayed new municipalities' inclusion. Additional challenges involved heterogeneity in structure and processes in TB treatment, both across and within municipalities. Limited access to smartphone or Internet among individuals in treatment also restricted VDOT use.

Conclusions: The use of VDOT in TB treatment supervision has shown potential to improve adherence, especially in vulnerable populations, and, as study progress, more data will be available on the VDOT effectiveness and its impact on Brazilian public health.

EP08 TB treatment risks uncovered: Tackling adverse drug events and drug interactions

EP08-769-18 Drug–drug interactions between antiretroviral and anti-TB therapy in adults and children: A systematic review of pharmacokinetic and clinical outcomes

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Background: Co-administration of antiretroviral therapy (ART) and anti-tuberculosis (TB) treatment is necessary in many HIV-infected individuals but presents major challenges due to drug–drug interactions (DDIs). Rifampicin and rifapentine, key components of first-line TB therapy, are potent enzyme inducers that can lower ART concentrations, especially among non-nucleoside reverse transcriptase inhibitors (NNRTIs) and protease inhibitors (PIs). Conversely, isoniazid may inhibit metabolism and increase toxicity risk.
This systematic review summarizes the pharmacokinetic and clinical outcomes of ART–TB co-treatment in both adults and children, with additional focus on pharmacogenetic variability.
Design/Methods: We reviewed 32 studies published through March 2025, including randomized controlled trials, cohort studies, and pharmacokinetic evaluations. Populations included HIV-infected adults and children receiving rifamycin-based TB therapy.
Outcomes assessed included antiretroviral plasma trough concentrations (Cmin), area under the curve (AUC), virologic suppression, and adverse events. Due to the heterogeneity of outcomes across studies, results were synthesized descriptively and stratified by ARV class (efavirenz, nevirapine, dolutegravir, PIs), age group, and genetic factors (CYP2B6, NAT2).
Results: Efavirenz showed stable exposure in most adult cohorts despite rifampin co-administration. However, up to 60% of children had subtherapeutic EFV levels. Nevirapine exposure was consistently reduced by rifampin and rifapentine, with lower concentrations associated with increased risk of virologic failure.
Dolutegravir required 50 mg twice daily to maintain effective exposure with rifampin, while rifabutin co-treatment often led to inadequate DTG and PI levels. Pediatric use of PIs with rifabutin was associated with neutropenia. CYP2B6 and NAT2 polymorphisms significantly influenced ART exposure and safety profiles.
Conclusions: This review highlights consistent pharmacokinetic risks across age groups and drug classes. Efavirenz remains the most robust ARV for adult TB co-treatment. Nevirapine and dolutegravir require careful monitoring or adjustment. Personalized ART guided by age and pharmacogenetics is essential to optimize TB–HIV outcomes.

EP08-770-18 Real-world challenges of 4-month rifapentine-moxifloxacin TB regimen: High hyperbilirubinemia in Thailand

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Background: The four-month rifapentine-moxifloxacin (HPMZ) regimen has been endorsed as an alternative to the standard six-month tuberculosis (TB) treatment. While clinical trials have demonstrated its efficacy and safety, real-world data, particularly in Asian populations, remain limited. This study evaluates the effectiveness and safety of the HPMZ regimen in Thailand.
Design/Methods: This prospective study was conducted at the Central Chest Institute of Thailand from September 2023 to February 2025. Eligible participants were drug-susceptible TB (DS-TB) patients. The HPMZ regimen consisted of daily rifapentine 1200 mg, moxifloxacin 400 mg, isoniazid 300 mg, and weight-based pyrazinamide for eight weeks, followed by rifapentine, moxifloxacin, and isoniazid for nine additional weeks. Patients were monitored at scheduled visits, and adverse drug reactions (ADRs) were recorded.
Results: Eleven participants were enrolled, with a median age of 55 years and a median weight of 52.7 kg. The mean rifapentine dose was 21.38 mg/kg, Hyperbilirubinemia was the most common ADR, leading to treatment discontinuation in 90.91% of patients. Grade 3 hyperbilirubinemia occurred in 63.63%, with peak bilirubin levels averaging 3.12 mg/dL. Plasma concentration analysis revealed rifapentine overexposure, with two patients exceeding the reported mean Cmax of 48.25 μg/mL and 41.89 μg/mL.
Conclusions: The high incidence of hyperbilirubinemia suggests that the fixed 1200 mg rifapentine dose may not be suitable for lower-weight populations. These findings highlight the need for weight-based rifapentine dosing and standardized ADR management protocols before broader implementation. Future large-scale real-world studies are needed to assess further the safety, efficacy, and optimal dosing strategies of the HPMZ regimen in diverse populations.

EP08-771-18 The efficacy and safety of varying doses of linezolid in people with rifampicin-resistant TB

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Background: Linezolid is a critical component in rifampicin-resistant tuberculosis (RR-TB) treatment yet the optimal dosage and duration are unclear.
Design/Methods: Patients aged 16–75 years with pulmonary RR-TB susceptible to fluoroquinolone were prospectively enrolled and received three 9-month oral regimens with different linezolid doses (600mg daily for 9 months, 600mg daily for 2 months, 600mg daily for 2 months and then 300mg daily for 7 months). The background regimen contained bedaquiline, cycloserine, pyrazinamide, and a fluoroquinolone.
Adverse events of interest, namely peripheral neuropathy, myelosuppression and optic neuritis, were graded according to the Common Terminology Criteria for Adverse Events (CTCAE). Treatment outcome was consistent with the 2022 WHO guidelines.
This interim analysis only included patients who have completed treatment.
Results: Among 172 prospectively enrolled RR-TB patients, treatment success rates were 86.0% (49/57) with 600mg linezolid daily for 9 months, 77.2% (44/57) with 600mg for 2 months, and 84.5% (49/58) with 600mg for 2 months followed by 300mg for 7 months.
Severe anemia occurred in one patient (1.8%) receiving 600mg daily for 9 months, one (1.8%) receiving 600mg for 2 months and two (3.4%) receiving 600mg for 2 months followed by 300mg for 7 months (P = 0.999).
Peripheral neuropathy occurred in 6 patients (10.5%) receiving 600mg daily for 9 months, 3 (5.3%) receiving 600mg for 2 months and 3 (5.2%) receiving 600mg for 2 months followed by 300mg for 7 months (P = 0.563). Grade 3 and higher peripheral neuropathy was only reported in one patient (1.8%) receiving 600mg daily for 9 months and one (1.8%) receiving 600mg for 2 months. So far there has been no report of linezolid-related optic neuritis.

	600mg for 9m (n = 57)	600mg for 2m (n = 57)	600mg for 2m and 300mg for 7m (n = 58)	P value
Treatment success — no. (%)	49 (86.0)	44 (77.2)	49 (84.5)	0.417
Anemia of any grade — no. (%)	11 (19.3)	12 (21.1)	13 (22.4)	0.918
Anemia of grade 3 or higher — no. (%)	1 (1.8)	1 (1.8)	2 (3.4)	0.999
White blood cell decreased, any grade — no. (%)	10 (17.5)	6 (10.5)	5 (8.6)	0.307
White blood cell decreased, grade 3 or higher — no. (%)	1 (1.8)	0	0	0.663
Platelet count decreased, any grade — no. (%)	2 (3.5)	2 (3.5)	2 (3.4)	1.000
Platelet count decreased, grade 3 or higher — no. (%)	1 (1.8)	0	0	0.663
Peripheral Neuropathy, any grade — no. (%)	6 (10.5)	3 (5.3)	3 (5.2)	0.563
Peripheral Neuropathy, grade 3 or higher — no. (%)	1 (1.8)	1 (1.8)	0	0.549
Optic Neuritis — no. (%)	0	0	0	NA

Conclusions: Three different dosing strategy of linezolid achieved a high treatment success rate with few cases of severe myelosuppression and peripheral neuropathy.

EP08-772-18 NAT2 genotypes and clinical characteristics associated with liver injury in people with TB treated with first-line anti-TB therapy

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Background: Anti-tuberculosis drug-induced liver injury (AT-DILI) is a significant adverse effect associated with first-line anti-tuberculosis therapy, impacting 10–20% of patients and potentially contributing to early treatment failure. Genetic variations in *NAT2*, which influence the metabolism of isoniazid, play a crucial role in determining susceptibility to hepatotoxicity. Specifically, individuals with slow acetylator genotypes are at higher risk for AT-DILI.
This study investigates the clinical factors and *NAT2* genotypes status, associated with hepatotoxicity in patients undergoing treatment in Thailand.
Design/Methods: This retrospective cohort study was conducted at Chiangrai Prachanukroh Hospital, Thailand. The study included tuberculosis patients registered between 2022 and 2024 who had documented *NAT2* genotypes status. Data collected included demographic characteristics (age, gender, body weight), clinical factors (chronic hepatitis B and C infections), and laboratory findings (liver function tests two weeks after initiating therapy). Logistic regression analysis was used to identify associations between clinical predictors, *NAT2* genotypes, and the occurrence of AT-DILI.
Results: A total of 710 patients were included in the analysis, of whom 70 (9.9%) developed hepatotoxicity. Among all patients, 249 (35%) were identified as slow acetylators. The mean age of participants was 54.5 ± 16 years, with males comprising 64% of the study. Chronic hepatitis B and C infections were detected in 6.3% and 2.7% of patients.NAT2 slow acetylator status and chronic hepatitis C infection were significantly associated with an increased risk of AT-DILI with adjusted OR: 3.78 (95%CI : 2.20-6.50; $p < 0.05$) and adjusted OR: 3.57 (95%CI: 1.10–11.68; $p< 0.05$) respectively.

Variables	Adjusted Odds ratio	95%CI	P-value
NAT2 Slow acetylator	3.78	2.20-6.50	<0.05
Hepatitis C infection	3.57	1.10-11.68	<0.05
age ≥ 40	1.87	0.91-3.87	0.09
BW < 35	1.56	0.41-5.92	0.51
Female	1.54	0.90-2.67	0.11

Conclusions: This study shows *NAT2* slow acetylator genotypes and chronic hepatitis C infection as key risk factors for AT-DILI in tuberculosis patients treated with first-line anti-tuberculosis drugs. These findings emphasize the importance of genetic screening and close monitoring of liver function in high-risk populations to reduce treatment interruptions and improve therapeutic outcomes

EP08-773-18 Active TB drug safety of novel drug-resistant regimens: Challenges and solutions in a decentralised setting

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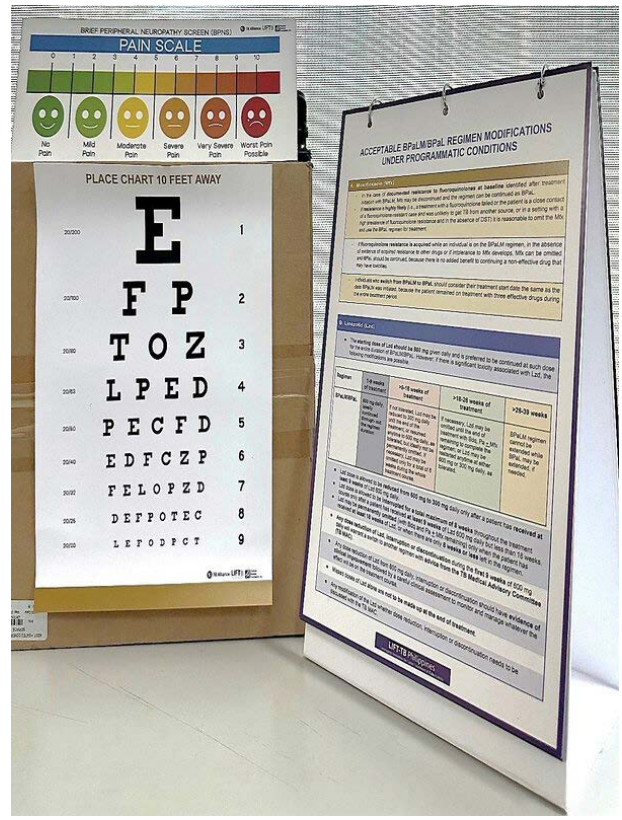
Background and challenges to implementation: Services for drug-resistant TB (DR-TB) have been recently decentralized to peripheral iDOTS facilities in the Philippines. Known for both its effectiveness and associated adverse events (AE) such as peripheral and optic neuropathy, and myelosuppression, the novel BPaLM regimen (Bedaquiline, pretomanid, linezolid, moxifloxacin) has been scaled up nationwide. aDSM implementation challenges were identified during 15 facility visits in 6 regions from June 2023 to June 2024, including weaknesses in: a) AE detection [absence of Snellen chart for visual acuity (VA) testing, space short of the required 20 feet, insufficient skills to properly perform the brief peripheral neuropathy screen (BPNS), VA and color vision tests, and interpret results]; b) AE management (lacking confidence to apply AE interventions endorsed by country guidelines, e.g., linezolid dose reduction, interruption or discontinuation at the correct timing); and c) AE recording and reporting (lacking monitoring sheets and malfunctioning electronic pharmacovigilance reporting platform).
Intervention/response: Interventions were targeted.
Intervention or response: Interventions were targeted to:
a) AE detection: provision of standard 20 feet and 10 feet Snellen charts, visual pain analogs, and actual demonstration of proper VA, color vision testing and BPNS;
b) AE management: provision of desk job aids/flip charts containing AE severity grading scales and guide to linezolid and regimen modification, and on-the-job clinical mentoring;
c) AE recording: creation of an aDSM monitoring sheet.



Results/Impact: AEs can become irreversible if addressed late, and can lead to treatment abandonment, if unmanaged. Health providers equipped with tools and training will make a key difference in the quality of life of patients, leading to better treatment outcomes.
Conclusions: aDSM is a critical component in the scale up of new regimens. Monitoring facilities captures real-world challenges in a decentralized setup. Targeted support through tools, teaching materials and mentoring are powerful means to impart skills and empower frontline health workers.

EP08-774-18 Adverse events in the treatment of rifampicin-resistant TB: Findings of comprehensive active drug-safety monitoring and management

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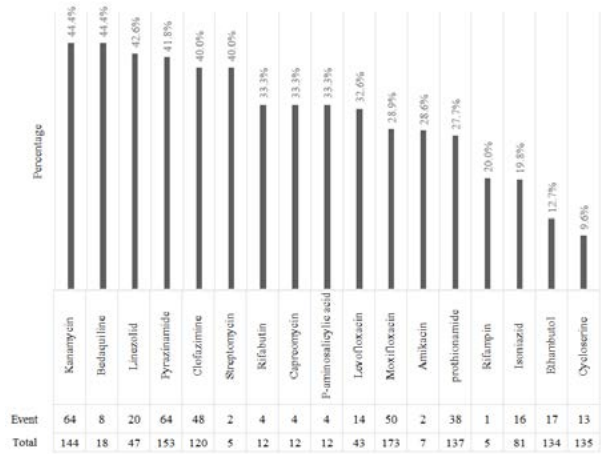
Background: Active tuberculosis drug-safety monitoring and management (aDSM) is recommended in the treatment of multidrug-resistant or rifampicin-resistant tuberculosis (MDR/RR-TB). We established and analyzed finding of comprehensive aDSM in Taiwan.
Design/Methods: We designed a treatment initiation form to capture characteristics of patients at baseline, a treatment review form to monitor symptoms, blood tests, QT intervals, and audiometry during treatment, and an adverse event report form for reporting severe adverse events (SAEs, grade 3 or more), serious adverse events and adverse events resulting in discontinuation of anti-TB drugs.
Severity of adverse events were categorized by using Common Terminology Criteria for Adverse Events (CTCAE) v4.03, and causality was assessed by using the World Health Organization – Uppsala Monitoring Centre (WHO-UMC) system.



Results: Of 333 MDR/RR-TB patients enrolled from May 2017 to February 2020, 329 (98.8%) had adverse events and 196 (58.9%) had SAEs during treatment. The top three SAEs were metabolism disorders (104, 31.2%), hearing impairment (102, 30.6%), and hepatotoxicity (64, 19.2%). Of 403 SAEs reported, 284 (70.5%) were classified as drug-related. The top five drugs associated with SAEs were bedaquiline (44.4%), kanamycin (44.4%), linezolid (42.6%), pyrazinamide (41.8%) and clofazimine (40.0%). Forty-four (13.2%) patients were hospitalized and 15 (4.5%) had prolonged hospitalization due to adverse events. One death was considered drug-related.
Conclusions: SAEs in the treatment of MDR/RR-TB were more frequent than previously reported and needed to be closely monitored and timely managed by systemic and comprehensive aDSM.

EP08-775-18 Cycloserine-induced neuropsychiatric toxicity in multidrug-resistant TB: Association with peak plasma concentration

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Background: Cycloserine (Cs) is a crucial anti-multidrug-resistant tuberculosis medication with significant clinical efficacy. However, its clinical application is limited by neuropsychiatric-related adverse drug reactions (ADRs).
Design/Methods: This study retrospectively evaluated the peak plasma concentration (C_{max}) of Cs and Cs-related neuropsychiatric ADRs, and analyzed the risk factors of developing neuropsychiatric ADRs. A multivariable ordinal logistic regression model was built to predict the incidence of neuropsychiatric ADRs.
Results: This study enrolled a total of 136 participants, with a cumulative incidence of neuropsychiatric ADRs of 12.5% (17/136). Patients with ADRs had significantly higher Cs C_{max} (26.50 mg/L vs. 18.11 mg/L, P=0.0003). The incidence of ADRs increased with higher Cs exposure, particularly when C_{max} exceeded 30 mg/L. Receiver operating characteristic analysis demonstrated the strong predictive value of C_{max} for neuropsychiatric ADRs. Notably, the predictive efficacy of the logistic regression model significantly improved after incorporating drinking history as a covariate, achieving a final predictive accuracy of 87.6%. The model demonstrated good calibration (Hosmer-Lemeshow test, P=0.563).
Conclusions: Cs C_{max} serves as a critical indicator for predicting Cs-related neuropsychiatric ADRs, with higher C_{max} correlating with an increased likelihood of neuropsychiatric ADRs. Dynamic monitoring of Cs C_{max} com-

bined with alcohol history assessment in clinical practice can enable accurate identification of high-risk populations for neuropsychiatric ADRs, thereby providing a scientific basis for developing individualized medication regimens and implementation of early interventions.

EP08-776-18 Incidence and severity of QTc prolongation associated with QT-prolonging drugs in rifampicin-resistant TB: Preliminary findings from a prospective cohort in China

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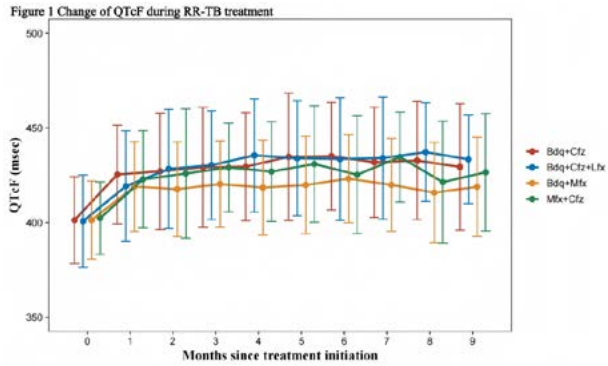
Background: Effective rifampicin-resistant tuberculosis (RR-TB) regimens often contain multiple QT-prolonging agents. It is important to understand the incidence and severity of QT prolongation in different drug combinations.
Design/Methods: Patients aged 16–75 years with pulmonary RR-TB were prospectively enrolled and received a 9-month oral regimen of a five-drug combination, comprising bedaquiline, linezolid, cycloserine, clofazimine, pyrazinamide, and a fluoroquinolone (moxifloxacin or levofloxacin). Electrocardiogram was conducted monthly, with QT intervals corrected using Fridericia's formula (QTcF). Prolonged QTcF was defined as >450 msec and significant QTcF prolongation was defined as a QTcF over 500 msec.
The relationship between specific drug combinations and QTcF prolongation was assessed with multivariable logistic regression analysis. Patients included in the current analysis have completed treatment and had at least two evaluable records of electrocardiogram.
Results: Among 549 RR-TB patients treated with 9-month oral regimens containing four QT-prolonging drug combinations, the distribution was: bedaquiline/levofloxacin/clofazimine (n = 167), bedaquiline/clofazimine (n = 137), bedaquiline/moxifloxacin (n = 157), and moxifloxacin/clofazimine (n = 88). QTcF prolongation occurred most frequently in the bedaquiline/levofloxacin/clofazimine group (50.3%), followed by bedaquiline/clofazimine (46.7%), moxifloxacin/clofazimine (43.2%), and bedaquiline/moxifloxacin (24.2%). Clinically significant QTcF prolongation was observed in 4.8% (8/167) of bedaquiline/levofloxacin/clofazimine recipients, 7.3% (10/137) of bedaquiline/clofazimine recipients, and 1.3% (2/157) of bedaquiline/moxifloxacin recipients.
Multivariable analysis demonstrated that three drug combinations increased risk of QTcF prolongation compared with the bedaquiline/moxifloxacin group: bedaquiline/levofloxacin/clofazimine (aOR = 3.132, 95% CI 1.927–5.090, P <0.001), bedaquiline/clofazimine (aOR = 2.707, 95% CI 1.632–4.491, P <0.001), and moxifloxacin/clofazimine (aOR = 2.375, 95% CI 1.341–4.209, P = 0.003). In contrast, a two-drug combination of QT-prolongers (aOR = 0.550, 95% CI 0.372–0.813, P = 0.003) reduced risk of QTcF prolongation compared to a three-drug combination.



Conclusions: The current study showed the bedaquiline/levofloxacin/clofazimine group had the greatest QTcF prolongation risk, warranting enhanced monitoring in such drug combinations.

EP08-777-18 Impact of the high-dose rifapentine regimens for drug-susceptible TB on peripheral blood neutrophils: A noteworthy treatment-related adverse event

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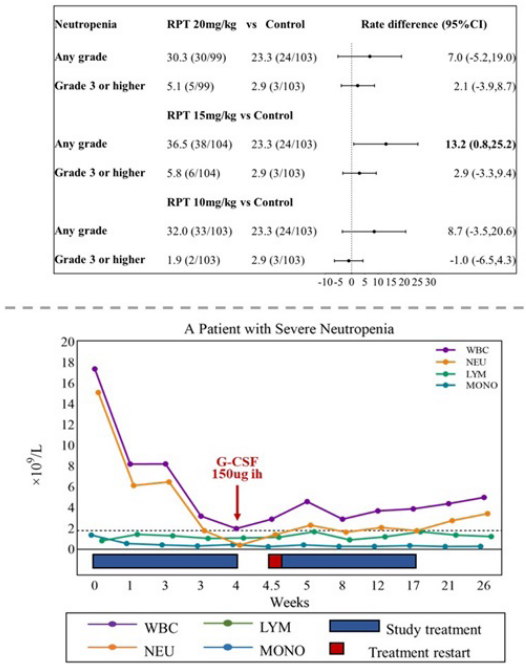
Background: Neutropenia was one of the most common adverse events during anti-tuberculosis treatment. This study aimed to evaluated the incidence of neutropenia with the use of 4-month regimen (2HPMZ/2HPM) for drug-susceptible tuberculosis.
Design/Methods: ORIENT trial (NCT05401071) was a multicenter randomized controlled trial in China to evaluate the safety of the high-dose rifapentine regimens, in which participants were randomly assigned to the control arm with the standard 6-month regimen (HRZE) or three investigational arms of 2HPMZ/2PMZ with rifapentine at different doses (10 mg/kg, 15 mg/kg, and 20 mg/kg). Complete blood count (CBC) was conducted at baseline, week 1, 2, 3, 4, 6, 8, 12, 17, 21, and 26 after treatment initiation. Neutropenia count decreased was recognized and graded according to *Common Terminology Criteria for Adverse Events version 5.0*. Incidence of neutropenia was compared between control arm and investigational arms using Pearson's $\chi 2$ or Fisher's exact test.
Results: A total of 409 patients were enrolled, with 103 in the control arm and 103, 104, 99 in the rifapentine 10, 15, 20 mg/kg arms, respectively. Neutropenia of any grade

occurred in 23.3%, 30.3%, 36.5% and 32.0% in the control arm and rifapentine 10, 15, 20 mg/kg arms, with significant difference between the control and the rifapentine 15 mg/kg arm (rate difference=13.2%, 95%CI: 0.8%-25.2%, P=0.038). There was no significant difference in grade 3 or higher neutropenia across four arms. One male patient in rifapentine 15 mg/kg arm experienced neutropenia of grade 4 (neutrophil count <0.5×10⁹/L). By discontinuing study medication and receiving a single subcutaneous injection of G-CSF, his neutrophil count returned to normal. Four days later, the original treatment regimen was reintroduced and the patient successfully completed treatment.



Abbreviations: LYM, lymphocyte; MONO, monocyte; NEU, neutrophil; RPT, rifapentine; WBC, white blood cell.

Figure1. Incidence of neutropenia in four arms and changes of complete blood count in a patient with severe neutropenia

Conclusions: A higher incidence of neutropenia was observed in rifapentine 15mg/kg arm, emphasizing the importance of close monitoring of CBC among patients receiving high dose rifapentine.

EP08-778-18 Five-year experience with anti-TB drug desensitisation in Singapore

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Background: Adverse drug reactions (ADR) to anti-tuberculosis (TB) medications pose significant treatment challenges, particularly in drug-susceptible TB where rifampicin (RIF), isoniazid (INH), and ethambutol (EMB) are cornerstone drugs. Desensitisation (both rapid and slow) is a strategy that may allow safe reintroduction of essential drugs.

We aimed to review the indications and outcomes of patients who underwent desensitisation at the National TB Care Centre, Singapore.

Design/Methods: We conducted a retrospective cohort study of patients who underwent TB drug desensitisation from 2020-2024. We collected data on the ADR experienced, which included mild allergic reactions, drug exanthem and severe hypersensitivity reactions such as Drug Reaction with Eosinophilia and Systemic Symptoms (DRESS), Drug-Induced Hypersensitivity Syndrome (DIHS), and others. Desensitisation regimens were classified as rapid (completed within 3-5 days) or slow (over 5 days).

Outcomes were categorised as successful (completion without recurrence of hypersensitivity), partially successful (required modified desensitisation protocol), or failed (drug permanently discontinued).

Results: Fifty-one patients (median age 54.5 years (range 19-85 years), 62% female) underwent desensitisation. Amongst the 51 patients, there were 56 instances of desensitisation whereby 5 patients required desensitisation to 2 anti-TB drugs. RIF desensitisation (80.3%, n= 45) was the most common, followed by INH (17.9%, n=10), and EMB (1.8%, n=1).

ADR included mild allergic reactions (29.4%), drug exanthem (39.2%), DIHS (11.8%), DRESS (7.8%), Generalised Exfoliative Dermatitis (5.9%) and anaphylaxis (5.9%). Slow desensitisation protocol was done in 53.6% of cases, particularly for severe reactions.

Overall, successful desensitisation was achieved in 71.4% of patients, partial success in 12.5%, and failure in 16.1%. Rapid desensitisation was more frequently employed for mild reactions, while slow desensitisation was more often used in severe reactions with similar outcomes.

Conclusions: TB drug desensitisation is a viable strategy to retain key anti-TB drugs in patients with ADR, including severe hypersensitivity reactions, with reasonable success rates.

EP09 Training & education to end TB

EP09-779-18 Building resilience: Capacity building for front-line workers to provide integrated symptomatic TB and HIV testing services for pregnant women at informal settings in Nigeria

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Background and challenges to implementation: Integrating health services in informal setting such as Traditional Birth Attendants (TBAs) presents a unique opportunity to address the dual burden of tuberculosis (TB) and HIV in underserved communities. Frontline workers like the TBA focal persons, mentor mothers (MMs) and community volunteers (CVs) in these settings face significant challenges, including limited training, scarce resources, and disjointed service delivery systems, all of which impede effective screening and care.
Hence, this study was aimed at evaluating the outcome of the training on service delivery enhancements and maternal health outcomes, particularly for pregnant women in underserved communities.
Intervention or response: HIV testing using combo kit and symptomatic TB screening services training was conducted for 95 frontline workers (17 CVs, 27 MMs, and 51 TBAs) to provide these services across the 17 local government areas of Abia State, Nigeria between January 2024 and December 2024. Pre- and post-training assessments measured workers' knowledge, skills and confidence level.
Service delivery outcomes were tracked, including the volume of integrated screenings performed and the detection rates of TB and HIV cases among pregnant women. Data were abstracted from registers domiciled at the informal settings and analyzed using descriptive statistics on Microsoft Excel.
Results/Impact: Post-training assessments revealed an 85% increase in workers' knowledge of symptomatic TB and HIV testing services, with 90% reporting high confidence in conducting integrated screenings.
Out of the 8000 pregnant women screened symptomatically for TB and provided HTS, 442 were presumptives, 6 diagnosed and notified (referred from the TBAs to hub facilities).
Also, 7898 eligible pregnant women were tested and referred for ante natal care, 89 were reactive and referred to comprehensive treatment sites.
Conclusions: In all, the training successfully empowered frontline workers with the requisite knowledge to integrate symptomatic TB screening and HIV testing services for pregnant women in informal settings, bridging a critical gap in maternal health outcomes.

EP09-780-18 Enhancing TB knowledge among Alaramma (informal school teachers) in Kano State: Output assessment

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Background: Tuberculosis remains a major public health challenge, particularly among underserved and high-risk groups such as children in undergoing informal education through the '*Almajiri*' schools, where limited knowledge of TB contributes to delayed diagnosis and treatment. There are over 1,000 Almajiri schools in Kano State, with an average student population per school of about 150 students. These schools are poorly funded with non-existent regulations, which expose these students (Age 5- 17 years) to vulnerabilities including lack of access to health care services. A two-days capacity building session was held for informal School Teachers (*Alaramma)* who are the norm holders in the Almajiri system of education, to provide TB screening and referral for their students.
Design/Methods: The intervention adopted a multi-step approach involving advocacy, capacity-building, and monitoring. Key activities done were Tsangaya school leadership in the state for easy of implementation of the program. A desk review and mapping of Almajiri school in high TB-reporting local government areas was done, with selection followed by a two-day capacity building session for 100 Alaramma teachers, focusing on sensitisation with Low-literacy tools, screening, and referral.
Online platforms e.g. WhatsApp, was used for reporting and mentoring for the Alarammas. A framework for monitoring and evaluation was done to track progress and assess intervention impact.
Results: The intervention significantly improved TB knowledge among 100 trained Alarammas, with pre- and post-assessment results showing an increase from 35% to 97% on basic knowledge. **Three months** post-training (November 2024 to January 2025), key outcomes included: **8,011 children** sensitized on TB, **141 presumptive TB cases** identified evaluated, **11 confirmed TB cases** successfully linked to care.
Background and challenges to implementation: Tuberculosis remains a major public health challenge, particularly among underserved and high-risk groups such as children in undergoing informal education through the '*Almajiri*' schools, where limited knowledge of TB con-

tributes to delayed diagnosis and treatment. There are over 1,000 Almajiri schools in Kano State, with an average student population per school of about 150 students. These schools are poorly funded with non-existent regulations, which expose these students (Age 5- 17 years) to vulnerabilities including lack of access to health care services and shelter, and abuse (physical, Mental, Sexual). A two-days training program was done for Informal School Teachers (*Alaramma)* who are the norm holders in the Almajiri system of education, across school 10 local government areas in TB care cascade their students, thereby empowering community structures to take ownership.

Intervention or response: The intervention adopted a multi-step approach involving advocacy, capacity-building, and monitoring.

Advocacy visits to leadership of Tsangaya school for ease of project implementation. A desk review and mapping of Almajiri school within high TB-reporting local government areas was done, which was followed by a two-day intensive training program for 100 Alaramma teachers, focusing on TB education, screening, and referral using low-literacy materials.

Online platform i.e. WhatsApp, was established to foster timely feedback and provision of mentoring support for the Alarammas. A framework for monitoring and evaluation to track progress and assess intervention impact.

Results/Impact: The intervention significantly improved TB knowledge among 100 trained Alarammas, with pre- and post-assessment results showing an increase from 35% to 97% on basic knowledge. **Three months** post-training (November 2024 to January 2025), key outcomes included:

- **8,011 children** sensitized on TB.
- **141 presumptive TB cases** identified and referred for further evaluation.
- **11 confirmed TB cases** successfully linked to healthcare facilities for treatment.

Conclusions: Training the Alarammas, promotes TB awareness, screening, and referral services, expands health care for vulnerable children and supporting TB-affected students to access care thus strengthening community-based TB interventions to sustain long term gains beyond funded projects.

EP09-781-18 Integrating gender-related knowledge into the national medical training curriculum and healthcare workplace practices

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Background: Considering how gender roles and inequalities shape diagnosis, treatment and healthcare services access, addressing healthcare biases and practices are essential for people-centered TB care. While Ukraine's national TB treatment standards recommend gender-sensitive patient counseling, there is little understanding of how healthcare workers implement these approaches in practice.

Design/Methods: A qualitative study was conducted in four regions of Ukraine involving in-depth interviews with 15 national and 7 regional experts, ten focus group discussions with 80 healthcare workers of varying cadres. The study analyzed national gender-related legislation and medical education curricula. Data were triangulated and analysed to explore themes of gender awareness, workplace gender equality policies and practices, gender-sensitive care provision.

Results: 102 participants joined the study during 01.10.2024-05.11.2024. Gender considerations were reflected in the analysed documents, including references to gender-sensitive approaches (in educational curricula, TB counselling materials), but there was no recommended programming to support patients accessing gender-sensitive care or healthcare workers in providing it. Most healthcare workers acquired gender awareness through short, didactic, not universally available professional development workshops. They found the intermittent training lacked foundational knowledge and practical skills to address patients' gender-specific needs. They were concerned that without a structure, achieving gender equality in healthcare remains challenging. The gap could hinder access to care, treatment adherence, and advocacy for patients facing gender-related barriers.

This was key in TB programming and primary health care, as gender-related barriers can be high at the point of symptom presentation and testing. Addressing gender-related barriers in medical education is crucial beyond TB care, as they demonstrate impact across all health conditions.

Conclusions: Foundational gender-related health education and training, covering intersectionality between gender and other social determinants, should be fully

integrated into national medical training curriculum, post-graduation health workforce training programs to promote gender equality in the workplace and improve TB outcomes through gender-sensitive services.

EP09-782-18 Assessing the effect of a community-driven, gender-responsive TB initiative on TB-related knowledge and stigma: A controlled before-and-after interventional study in peri-urban communities, Nigeria

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Background: Men account for more than two-thirds of TB cases in Nigeria and experience longer delays in accessing care and worse health outcomes than women. Our previous research identified major barriers to care, including TB-related stigma and limited TB knowledge.
With local multisectoral stakeholders, we co-developed a targeted intervention, implemented the intervention in peri-urban settings, and evaluated its impact on TB knowledge and stigma.
Design/Methods: Two intervention (IC) and two control (CC) cluster communities were selected by convenience. A Local TB Action Group (LTAG) was established in each IC, comprising key community members and leaders. ICs received men-led TB awareness campaigns and mobile X-ray-mediated TB screening in men's socio-cultural congregate settings for 6 months. CCs continued routine TB programme activities.
A baseline household survey assessing TB knowledge and stigma and a post-intervention survey were conducted across all clusters using locally validated data collection tools. Knowledge and Stigma were rated numerically on a 10-point and 44-point scale, respectively (higher scores equating to higher levels). Mixed-effects linear regression analyses were performed to evaluate the intervention's effect on TB-knowledge and stigma adjusted for covariates including education, employment, and socioeconomic status.
Results: Overall, 3,321 households were surveyed, 1,679 and 1,642 in the CCs and ICs, respectively. The intervention was associated with a significant average decline in stigma compared to the CCs (estimate: -24.46 [95% CI=-25.20 – -23.71], Table).
Similarly, TB-related knowledge significantly improved in the ICs with an estimate of +4.07 (95% CI=+3.746 – +4.392).

Table: mixed effects linear regression output for effect of intervention on TB-related stigma and knowledge

	Linear regression output for stigma score		
Effect	Estimate	Std. Error	95% CI
Community Intervention	0.954	1.611	−2.203 – 4.111
Time (End line)	−2.154	0.266	−2.676 – −1.633
Intervention * End line Interaction	**−24.457****	0.379	**−25.200 – −23.714**
	Linear regression output for knowledge score		
Effect	Estimate	Std. Error	95% CI
Community Intervention	−1.210	0.407	−2.007 – −0.413
Time (End line)	−0.679	0.116	−0.906 – −0.452
Intervention * End line Interaction	**+4.069****	0.165	**+3.746 – +4.392**

*Model setup: primary fixed effect variable="Cluster type*Time". Secondary fixed effect variables=sex, education, employment, and socio-economic status. Random effect variable=Cluster ID.

**Adjusted measures accounting for Sex, Education, Employment and Socio-economic status.

Conclusions: A community-led gender-responsive intervention improved knowledge and reduced TB-related stigma in vulnerable peri-urban settlements in Nigeria.

EP09-783-18 Overcoming language barriers and stigma in communication on TB: Using artificial intelligence (AI) for person-centred TB information for people from migrant populations

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Background: TB has become an increasingly rare disease in the Netherlands, largely affecting people who reside - but were not born - in the Netherlands. Around 80% of all TB patients in 2023 were born in countries outside the Netherlands coming from 78 different countries.
Current tools to spread awareness and improve knowledge have largely centred on mass-media interventions such as videos or paper-based pamphlets.
Given recent advances in use of Large Language Models (LLMs), AI-enabled chatbots provide a highly interactive, personalized digital interface in a variety of languages, presenting a direct opportunity for improving knowledge of TB in a potentially cost-effective and scalable manner.
Design/Methods: We gathered relevant source materials to "train" the chatbot. The chatbot was deployed via web browser and WhatsApp. During a pilot phase, two groups of volunteers, TB professionals and general public, conversated with the chatbot in different languages on a variety of TB related topics such as TB and immigration, contact investigation, and TB screening. Survey data and chat conversations were analyzed and shared with pilot users during a focus group discussion.
Results: The language skills (grammar, spelling) were diverse with excellent rating in English and Dutch, but poorer rating in less common spoken languages (Tigrinya and Amharic).

The accuracy of responses were scored high for general TB information, but diverse for specific topics (TB screening, contact investigation).
A majority of the pilot users found the chatbot to be realistic and engaging, and that the responses were useful, appropriate and informative.
Conclusions: The use of an AI-enabled chatbot is perceived as an appropriate medium to provide information on TB. However, several components needs to be improved upon. As of early 2025, we are making significant improvements to the knowledge base of the chatbot and aim for deployment by the end of 2025.

EP09-784-18 Strengthening capacity for TB services: Effectiveness analysis of training methods, a comparative study

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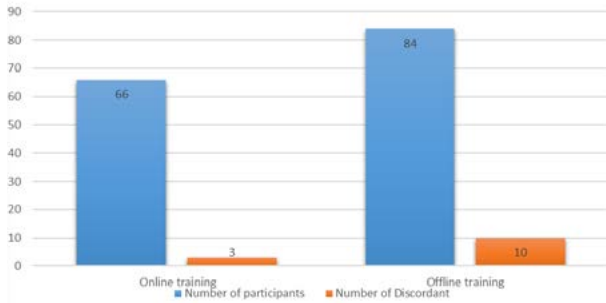
Background and challenges to implementation: As digital transformation accelerates the debate between the effectiveness of online and offline training has gained significant attention. This study investigates and compares the effectiveness of these two training modes by examining core factors such as knowledge acquisition, skill development, learner engagement, and overall satisfaction. A comparative analysis was conducted using data collected from participants enrolled in structured online and offline "1 day training on mWRD EQA" among 150 participants organized by NTP Bangladesh. Each group underwent identical training content delivered through their respective platforms. Participant's performance was evaluated by comparison between the participant's result and the assigned values of the proficiency testing panel.
Intervention or response: Results showed that online training is highly effective in delivering theoretical knowledge, especially due to its flexibility of number of participants, reduced costing and the ability for learners at their own pace.
However, challenges such as reduced interaction, self-discipline issues, and limited hands-on experience. On the other hand, offline training demonstrated greater effectiveness in fostering interpersonal communication, collaborative learning, and real-time feedback. Participants in offline sessions showed stronger engagement levels and better performance in practical skill assessments, largely due to direct trainer support and structured learning environments.
Results/Impact: On evaluation of proficiency testing panel value of 150 participants 4.5% online batches and 11.9% from offline batches had the discordant result.



Conclusions: The analysis concludes that the effectiveness of training is not solely dependent on the mode of delivery but on how well the content, interactivity, and learner support are integrated. A blended training approach, combining the strengths of both online and offline methods, is recommended to maximize learning outcomes. This study provides valuable insights for educators, trainers, and organizations seeking to optimize their training strategies.

EP09-785-18 Digitally-enabled youth engagement model to *support HCWs to improve TB presentation to care in underserved urban slums of India*: The Take Charge Against TB program

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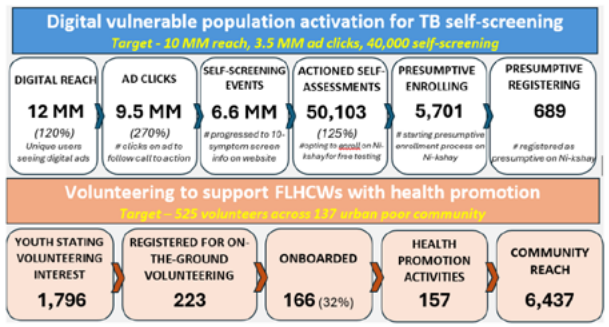
Background and challenges to implementation: Tuberculosis continues to pose significant public health challenge in India. Among urban youth, stigma, misinformation and limited knowledge discourages timely healthcare-seeking. To address these barriers, they should be empowered as TB services beneficiaries and active community change agents.
Intervention or response: The "Take Charge Against TB" program, with Johnson&Johnson Foundation support, was conceptualized and implemented through a dual activation approach—focusing on digital and on-the-ground mobilization of youth (18–34 years) from lower socio-

economic strata in Hyderabad, Pune, Delhi, in addition to frontline healthcare workers (HCWs) capacity building to accelerate early diagnosis and improve proactive presentation to care. To inform intervention design for youth, a digital baseline survey took place in advance of two-pronged mobilization strategy roll-out (social media messaging with call to action to undertake self-screening and follow-on testing alongside invitation to volunteer in their communities for health promotion).

Results/Impact: The knowledge, attitudes and practice (KAP) survey engaged 4.2 million youth, yielding 152,000 responses (3.6% response rate, male/ female ratio 77% - 23%). 35% were unaware that TB is curable, only 5% recognized all major TB symptoms, and 56% did not know TB diagnosis and treatment were free of cost. Additionally, 68% of respondents did not perceive themselves at risk for TB, 16% did not know of any action to take in case of symptoms and 42% expressed stigma associated perceptions towards other people living with TB. 12 million individuals were reached through social media, with 50,100 actioned self-assessments and nearly 1,800 stating interest to support HCWs with health promotion (of which 10% registered for onboarding and on-the-ground execution) (Figure 1).

Figure 1 – Impact of social media intervention under the Take Charge Against TB program*



** Take Charge Against TB program - a public health initiative by Johnson & Johnson, in collaboration with PATH and TBAlert India, partially funded by J&J India Community Impact and by Johnson & Johnson Foundation (registered charitable organization that reflects the commitment of J&J to create a world without health inequities by closing the gaps between communities and the care they need).*

Conclusions: Findings indicate significant KAP gaps about TB among urban poor youth and provide proof points for targeted health promotion interventions with actionable calls to action that improve proactive presentation to care.

EP09-786-18 Results from "Empowering frontline healthcare workers through holistic upskilling intervention on 3C's for underserved urban poor communities of India": The Take Charge against TB programme

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Background and challenges to implementation: Frontline healthcare workers (FLHCWs) hold significant potential in expanding TB care by bridging critical gaps in reaching underserved populations to accelerate early diagnosis. Their strategic mobilization can be optimized through structured upskilling and clear scope of work deliverables.

Intervention or response: A capacity building intervention for FLHCWs (Accredited Social Health Activists, Auxiliary Nurse Midwives, medical officers, chemists, and informal care providers) in Hyderabad, Pune, Delhi, was developed addressing 3Cs (Competency development in screening & referral, Connection development for stigma eradication and Confidence development for community trust building) based on needs assessment as part of the "Take Charge Against TB" initiative, with Johnson&Johnson Foundation funding support.

A modular curriculum was developed with expert inputs from India Central TB Division and WHO, with iterative direct feedback from FLHCWs. The participatory approach ensured content was culturally relevant, linguistically accessible and practical.

Knowledge, attitudes and practices (KAP) improvement were assessed pre and post-training. FLHCWs received continued learning reinforcement, supervised mentorship and were monitored for TB referrals post-training.

Results/Impact: Between December 2024 and March 2025, 21 training events were conducted, covering 700 FLHCWs, with significant FLHCW KAP improvement. Post-training evaluations among 481 FLHCWs showed a mean KAP improvement of 12%, increasing to 87%, from 74.8% baseline. The biggest immediate change was in Attitudes (from 69% baseline to 86.9% post-training), followed by change in knowledge (from 86.5% baseline to

95.9%) and change in Practices (from 68.4% baseline to 78.2%). Within a month, 10% of trained FLHCWs (that previously had not taken such actions), initiated referrals for enrolling presumptive persons with TB, resulting in 128 individuals undergoing molecular diagnostic testing, with 9 confirmed persons with TB.

Component	Correct Pre-Test N - 562	Correct Post-Test N - 481	Pre-Post Difference	
			actual	% change
Knowledge	86.54%	95.91%	9.38%	11%
Attitude	69.31%	86.90%	17.60%	25%
Practice	68.43%	78.25%	9.82%	14%
	74.8%	87.0%	12.26%	16%

** Take Charge Against TB program - a public health initiative by Johnson & Johnson, in collaboration with PATH and TBAlert India, partially funded by J&J India Community Impact and by Johnson & Johnson Foundation (registered charitable organization that reflects the commitment of J&J to create a world without health inequities by closing the gaps between communities and the care they need).*

*Table 1. Improvement in frontline healthcare worker knowledge, attitude and practice survey under the Take Charge Against TB program**

Conclusions: Structured FLHCW upskilling improves TB KAP, even from relatively high baselines, leading to increased TB referrals and follow-on notifications. Integrating such interventions into national TB programs can further accelerate early diagnosis.

EP09-787-18 Effective capacity building for TB prevention and care: A modernised training approach for programme managers in India

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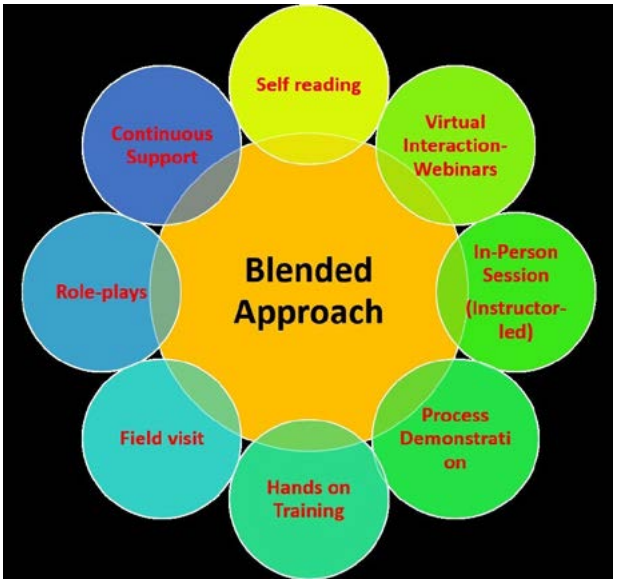
Background and challenges to implementation: Program Managers are critical to the success of National TB Program, providing leadership and oversight. However, their role is increasingly complex due to evolving program demands, frequent updates, and high staff turnover. Training needs are extensive—over 400 hours—spanning technical, managerial, and communication skills.
Traditional classroom models are inadequate, require long absences, affect service delivery, and don't cater to diverse learning needs. A scalable, resource-efficient approach is essential.
Intervention or response: To address this, a Modernised Training System (MTS) was developed and training operations optimized. Content was mapped to competencies and reorganized into blended modules—self-paced, instructor-led, practical, and field-based.



Knowledge-based modules were assigned for self-paced or virtual learning, while critical programmatic areas like case finding, TB prevention, and treatment were covered through interactive sessions. Field visits exposed managers to the care cascade—DR-TB wards, labs, AIC practices, and supervision. Communication skills were strengthened through role plays and peer learning.
This approach allowed program managers to attend in-person training for a limited time, focused on acquiring hands-on skills and practical experience, thereby optimizing both time and financial resources. Progress was tracked via quizzes and assessments.
Results/Impact: Standardized, modular training content was developed and rolled out with supporting SOPs and a detailed Trainer's Guide, enabling decentralized implementation across states. So far, 194 program managers have been trained. Average pre- and post-test scores improved from 58% to 72%, reflecting strong knowledge gains. Feedback indicated high satisfaction—78% rated content 8 or above, and 84% rated the overall experience 8 or above on a scale of 1 to 10.
Conclusions: The optimized training model for program managers under NTEP has successfully addressed challenges. The structured, blended, and flexible approach has enhanced the capacity of program managers while minimizing disruptions to service delivery—laying a strong foundation for sustained and effective TB control across the country.

EP09-788-18 TB training through Camparience (camping and experience) learning method: Engaging 20 young leaders across 18 regions in Indonesia in 2024

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Background and challenges to implementation: Youth, as dynamic community members and digital influencers, can drive TB awareness and advocacy**.** However, current training programs often use theoretical methods that lack real-world relevance. Experiential role-playing is needed to equip young leaders with practical insights and strategies to address TB challenges effectively

Intervention or response: To overcome the challenge of overly theoretical TB training, we implemented the Camperience program for 20 young leaders from 18 diverse Indonesian regions in September 2024. This training utilized the 70-20-10 human resource development framework, structuring learning into three interconnected components.

The 70% experiential learning component consisted of a 5-day simulation set in a fictional country, where participants navigated advocacy challenges with a government displaying limited commitment to TB. This immersive experience strengthened participants' competencies in policy engagement and strategic messaging. The 20% social learning element enabled peer-to-peer learning through activities such as organizing community-driven campaigns and conducting a simulated press conference to engage journalists.

The remaining 10% formal learning provided structured inputs from experts in public health, media engagment and advocacy. Through pre- and post-test, we quantitatively confirmed gains in knowledge and advocacy competencies. As a result, participants executed impactful media outreach and a creative protest, proving the training's practical success.

Results/Impact: The Camperience training enhanced TB advocacy skills, with pre-and post test results showing a p-value of 0.00, indicating a significant increase in knowledge. Participants also demonstrated strong commitment to their roles in the community by developing campaign and advocacy plans to their respective regions. The experiential, practice-based learning approach proved effective, although some participants faced challenges in connecting theory to practice.

Conclusions: Camperience training empowers youth as TB advocacy champions, revolutionizing public health engagement. We recommend its hands-on strategies for TB programs, readily scalable to ignite vibrant youth-led health movements worldwide.

EP09-789-18 Bridging gaps in TB/HIV research: Empowering Eswatini's future scholars

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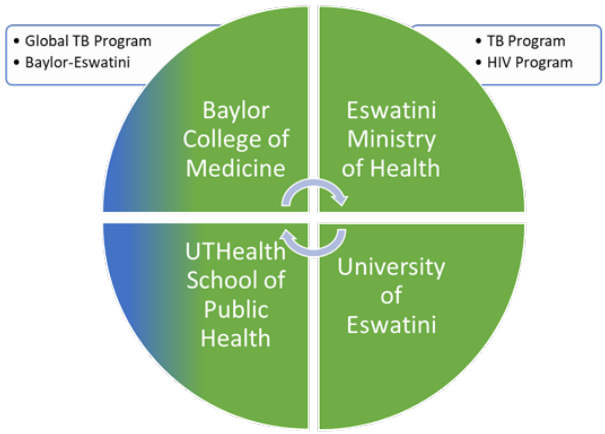
Background and challenges to implementation: As of 2020, the University of Eswatini (UNESWA), the largest research university in the country, did not offer PhD programs to advance TB/HIV research.

Given the high incidence of TB/HIV, Eswatini faces a gap in research training capacity in pediatric populations. Baylor College of Medicine, the University of Texas Health Science Center at Houston (UT Health Houston), Baylor Foundation Eswatini, UNESWA, and the Eswatini Ministry of Health implemented the D43 Siyakhula Project in July 2021 to address this gap. Siyakhula builds local capacity by fostering collaborations between US-based faculty and local researchers.

Intervention or response: The D43 Siyakhula program, the only active D43 training program in Eswatini, trained two cohorts of short-term scholars in applied TB/HIV research in pediatric populations while offering support for pilot research projects. It also supports long-term doctoral students at UT Health Houston in transitioning to independent investigators, with these students also mentoring short-term scholars. Yearly surveys assess trainee satisfaction and knowledge to improve the program.



Results/Impact: Doctoral students studying health economics, biostatistics, and health policy are on track to completion and will return to Eswatini to apply these skills. Forty short-term scholars have been trained, 11 in the first cohort and 26 in the second. 37 of 40 (92.5%) submitted competitive TB/HIV research proposals, with 28 funded. One trainee secured external funding. Participants have published 10 peer-reviewed manuscripts and presented five abstracts at international conferences. The program improved training quality, with an increase in scholars reporting the knowledge gained will be useful in their roles from the first cohort (66%) to the second (71%).

Conclusions: This program builds training and research capacity for TB/HIV research in Eswatini through a collaborative model. The program has improved the training quality of scholars, underscoring its growing impact and potential to contribute to continued advancement of research and capacity-building efforts in Eswatini.

ABSTRACT PRESENTATIONS WEDNESDAY 19 NOVEMBER 2025

ORAL ABSTRACT SESSION (OA)

OA06 Genotypic and phenotypic resistance testing for TB

OA06-149-19 Phenotypic and genotypic resistance to key TB drugs in Mycobacterium tuberculosis isolates from endTB-Q participants

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Background: Acquisition of drug resistance (ADR) threatens successful treatment of drug-resistant TB. In the endTB-Q trial, 745 participants with rifampicin-,fluoroquinolone-resistant TB were randomized to the WHO standard regimen or 6-9 months experimental regimen containing bedaquiline, clofazimine, delamanid, linezolid (BDQ, CFZ, DLM, LZD). For participants culture-positive at ≥week 16 of treatment, we describe baseline and ADR, phenotypic resistance (pR) and variants in resistance-associated genes.
Design/Methods: Minimum-inhibitory concentrations (MICs) were determined using broth microdilution plates, with resistance defined as MIC>critical concentration (CC). Whole genome sequencing (WGS), performed on Illumina, was analyzed with TB-Profiler to report resistance-conferring variants (RAVs), or in their absence, for pR isolates, variants of uncertain significance.
Results: We analyzed 227 isolates from 32 participants. Of 11 who did not experience ADR, 2 were baseline-pR: one to CFZ (plus BDQ-MIC at CC) carrying an *Rv0678* RAV, and one BDQ+CFZ+DLM carrying an *atpE* and *ddn* RAV. Twenty-one participants showed ADR. Three with baseline pBDQ-R isolates, two with *Rv0678* RAVs and one wildtype (also throughout follow-up), experienced ADR to an additional drug. The other 18 (86%) participants developed pBDQ-R. For 14, RAVs were detected in *Rv0678* (n=11), *pepQ* (n=2) and *atpE* (n=1); four *Rv0678* RAVs were transient.
In the remaining 4/21, *Rv0678*-uncertain variants correlated with increased BDQ-MIC, three >CC (one preceding an additional *Rv0678* RAV) and one reaching the CC.
Five participants acquired pDLM-R: two with *ddn* RAVs, two wildtype and one with a transient low-frequency uncertain variant.
Three participants developed pLZD-R, one with an *rplC* RAV detected after pR emerged. WGS identified RAVs in 2/4 baseline pBDQ-R, 15/18 (83%) BDQ-ADR and 2/5 (40%) pDLM-ADR cases.

Conclusions: Most observed ADR included BDQ. WGS-identified RAVs could explain most pR cases, but not all, suggesting additional mechanisms of resistance. For two participants experiencing ADR, pR preceded acquisition of (hetero)resistant variants. Hence, longitudinal sequencing may enhance genotypic ADR detection.

OA06-150-19 Comprehensive analysis of mutations associated with rifampicin and isoniazid resistant tuberculosis in a high burden setting

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Background: Adolfo Lutz Institute is the public health reference laboratory for tuberculosis (TB) diagnosis in the state of São Paulo, Brazil. Over 20,000 new TB cases are notified in São Paulo annually. Since there is limited information on TB molecular drug resistance in Brazil, the aim of this study was to describe the mutations associated with rifampicin (RIF) and isoniazid (INH) resistance in *Mycobacterium tuberculosis* complex (MTBC) isolates from TB patients in the state of São Paulo, between 2019-2021.
Design/Methods: Mutations in *rpoB, katG*, and *inhA* promoter in MTBC clinical isolates were detected using the GenoType MTBDR*plus* line probe assay (LPA). Inferred mutations by LPA underwent Sanger sequencing. Additionally, the prevalence of RIF-resistant (RIF-R), INH-resistant (INH-R), and MDR-TB was calculated.
Results: Among the 13,489 MTBC isolates with valid LPA results, 657 (4.9%) showed mutations. The overall prevalence of RIF-R, INH-R, and MDR-TB in São Paulo was 1.5%, 2.0%, and 1.2%, respectively.
A significant proportion of RIF-R isolates presented inferred *rpoB* mutations (89.1%), most of them being the borderline H445N. The *inhA* promoter C-15T mutation was predominant among INH-R isolates (52.8%).
Most of the MDR isolates presented the *rpoB* S450L+*katG* S315T1 mutations. Gene sequencing identified 8 isolates with mutations not included on the WHO catalogue (*rpoB* L430Lfs*10 [1290_1299del gagccaattc] (n=1), Q432R [1295 a>g] (n=1), Q432Hfs [1295_1304del aattaatgga] (n=1), M434Qfs [1300_1305del atggac] (n=1); *katG* with deletions (n=3) - the one tested on MGIT was INH-R; and *inhA* promoter c-20g (n=1), which tested INH-R on MGIT).
Phenotypic drug susceptibility testing revealed the 0.5 µg/mL critical concentration of RIF on MGIT still misses the *rpoB* borderline mutations L430P and H445N.
Conclusions: The findings emphasize the need for ongoing surveillance and the integration of molecular and phenotypic methods to ensure accurate detection and management of drug-resistant TB in our setting.

OA06-151-19 FreezeTB: A fast, reliable, economical tool to zap endemic tuberculosis using nanopore targeted next generation sequencing

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Background: Alaska has the highest incidence of Tuberculosis (TB) in the United States with disease disproportionately affecting Alaska Native/American Indian (AN/AI) populations and children under 14 years of age who account for almost a third of cases. With a case fatality rate of 8% during TB treatment and a quarter of TB cases lacking sputum culture to enable drug resistance testing, the FreezeTB initiative was launched to develop diagnostic tools tailored to meet the challenges of care in Alaska while being translatable to other settings.
Design/Methods: We sought to develop a rapid and cost-effective method for identifying drug resistant mutations in *Mycobacterium tuberculosis* using targeted next generation sequencing (tNGS). We designed a primer multiplex, amplification and barcoding protocol, and sequencing workflow for nanopore sequencers, including portable devices. We programmed an open-source (OS) software that detects mutations associated with drug resistance recognized by the World Health Organization. One hundred blinded *M. tuberculosis* isolates from Alaska (59 resistant, 41 pan-susceptible) were selected and underwent analysis with our lab and bioinformatic workflow, then compared to phenotypic drug susceptibility testing (pDST) using BACTEC MGIT 960.

Figure 1. Heat maps showing the results of 100 Alaska *M. tuberculosis* isolates, with results from phenotypic drug susceptibility testing (left) compared to results of FreezeTB targeted next generation sequencing (right), with each row representing an isolate. Phenotypic DST breakpoints are INH 0.1 µg/mL (reflex to 0.4 µg/mL if 0.1 µg/mL is resistant), RIF 1.0 µg/mL, EMB 5.0 µg/mL, PZA 100 µg/mL, and STR 1.0 µg/mL (LFX 1.0 µg/mL and MFX 0.25 µg/mL on request for isolates collected after 2022).

Results: Compared to pDST, FreezeTB workflow identified 80% of rifampin resistance (n=4/5), 74% of isoniazid resistance (n=37/50), 100% of streptomycin, ethambutol

and ethionamide resistance (n=9/9, 3/3, and 9/9 respectively) but only 14% of pyrazinamide resistance (n=1/7). FreezeTB is designed to detect resistance to fluoroquinolones, bedaquiline, pretomanid/delamanid, and linezolid, however no isolates had this resistance pattern. Using a portable sequencer, each sample was sequenced for under $35.

Conclusions: FreezeTB provides a one-day laboratory and bioinformatic workflow for sequencing *M. tuberculosis*; offering an OS software with graphical user interface and a laboratory workflow costing under $35 per sample. Freeze TB can accurately determine resistance for rifampin, isoniazid, streptomycin, ethambutol and ethionamide and is designed to detect resistance in newer drugs, such as bedaquiline and pretomanid.

OA06-152-19 One-day TB diagnosis and resistance mapping with BD MAX MDR-TB and ONT AmPORE assays

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Background: The WHO has endorsed a broad range of molecular biological rapid diagnostic tests (mWRDs) for TB diagnosis and detection of key resistance markers for rifampicin and isoniazid. However, rapid tests for resistance markers are still lacking for drugs used in the BPaLM regimen. Targeted next-generation sequencing (tNGS) can detect resistance to all relevant anti-MDR-TB drugs with high accuracy, but challenges remain in sample availability and DNA extraction. We addressed this by combining the BD Max™ MDR-TB test with the AmPORE tNGS assay (Oxford Nanopore Technologies). This "One-Day Diagnostic Platform" (ODDP) enables comprehensive analysis from a single sputum sample within one working day.

Design/Methods: Spiked samples were created from native sputum and MTB strains with diverse resistance profiles. Clinical samples were collected from the Asklepios Pulmonary Hospital in Gauting, Germany, and the Republican TB Hospital in Machiton, Vahdat District, Tajikistan. Samples were first analyzed using the BD Max™ MDR-TB assay. DNA was then recovered from the instrument and processed with the ONT AmPORE tNGS assay. Discrepancies between BD Max™ and AmPORE were resolved by whole genome sequencing (WGS) using the Illumina platform. Statistical analyses were performed with Stata 16.0.

Results: The entire workflow was completed within an average of 8.5 hours (picture 1) , with the following time frame:
i. 0.25 h sample prep,
ii. 3 h BD Max™,
iii. 2.5 h multiplex PCR,
iv. 0.75 h library prep,
v. 1 h tNGS,
vi. 1 h data analysis.
Using a Ct value ≤28.0 as a threshold, 73% of clinical and 83% of spiked samples yielded resistance profiles covering ≥12 antibiotics. Only 8% and 10% of tNGS runs were unsuccessful, i.e., covering less than 12 antibiotics.

Time	Task	Equipment
8:00 – 8:15	Samples preparation	Work bench
8:15 – 11:15	BD Max™ MDR-TB and DNA recovery	BD Max™
11:15 – 13:45	Multiplex PCR for tNGS	Work bench, thermocycler
13:45 – 14:30	Barcoding and library purification	Work bench, thermocycler
14:30 – 15:30	Sequencing run	MinION
15:30 – 16:30	Data analysis	PC

Actual Work Day times (min)

Number of samples	Time to completion (hours)	Time to completion (minutes)
12	7.8	467
12	8.0	480
11	9.1	545

Conclusions: Integrating BD Max™ with ONT-based tNGS offers a rapid, accurate, and comprehensive diagnostic tool for MDR/XDR-TB, with potential for same-day results from a single sputum sample.

OA06-153-19 Targeted next-generation sequencing - A promising approach in the diagnosis of Mycobacterium tuberculosis and drug resistance

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Background: Despite China's progress in tuberculosis (TB) diagnostics (62% bacteriological confirmation rate in 2022), unmet needs persist for rapid, comprehensive detection of Mycobacterium tuberculosis complex (MTBC) and drug resistance. Targeted next-generation sequencing (tNGS) offers simultaneous pathogen identification and resistance profiling, yet its clinical validation remains limited.

Design/Methods: This retrospective study analyzed 128 patients with suspected pulmonary TB (91 MTBC, 18 non-tuberculous mycobacteria [NTM], 19 non-mycobac-

terial infections) from Changsha Central Hospital (2021-2023). Bronchoalveolar lavage fluid (BALF) samples underwent parallel testing with tNGS, Xpert MTB/RIF, and mycobacterial culture. Diagnostic performance was assessed against composite clinical standards. Drug resistance concordance was evaluated using phenotypic drug susceptibility testing (DST) as reference.

Results: tNGS demonstrated superior sensitivity versus conventional methods: MTBC detection: 86.8% (79/91) vs. 61.5% for culture (p<0.001) and 59.3% for Xpert (p=0.002); NTM identification: 100% (18/18) sensitivity vs. 55.6% for culture, Turnaround time: 1.06±0.29 days vs. 34.26±17.92 days for culture (p<0.001); For resistance detection in 28 culture-positive cases, tNGS showed: 89.3% accuracy for rifampicin (100% sensitivity, 85% specificity), 100% concordance for levofloxacin resistance, Identified minority variants (e.g., rpoB L511P) missed by Xpert.

Conclusions: tNGS significantly improves diagnostic yield and speed for MTBC/NTM while enabling comprehensive resistance profiling. Its ability to detect co-infections and rare resistance mutations addresses critical gaps in conventional algorithms. Multicenter prospective studies are warranted to standardize tNGS implementation in TB diagnostic pathways.

OA06-154-19 Ai-enhanced detection of rifampicin or multidrug resistance in tuberculosis using MALDI-TOF lipid spectra: A novel approach to DST

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Background: Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (Mtb), remains a major global health concern. According to the WHO, 10.8 million cases were reported in 2023. Multidrug-resistant TB (MDR-TB), particularly rifampicin (RIF) resistance, poses serious treatment challenges. While MALDI-TOF has been utilized to detect antimicrobial resistance in other pathogens, its application to lipid analysis of Mtb is limited.

This study evaluates lipid profiles of drug-susceptible (DS) and rifampicin-resistant (RIF-R) or multidrug-resistant (MDR) strains using MALDI-TOF and machine learning to support improved drug susceptibility testing (DST).

Design/Methods: A total of 368 Mtb isolates (184 DS, 184 RIF-R or MDR) were collected from respiratory samples at the Korean Institute of Tuberculosis between 2022 and 2024. Lipids were extracted via autoclaving and chloroform:methanol (9:1) treatment. Spectra were acquired using the Autoflex-maX(Bruker) in positive reflector mode (300–3500 m/z) with DHB as the matrix. Peak presence within ±1.0 m/z was binarized, and chi-square analysis was used to select significant features, which were then applied to Random Forest, Logistic Regression, and Decision Tree models for classification.

Results: Eighteen candidate peaks were identified from spectral differences, with ten showing statistical significance ($p < 0.05$). Peaks at 599, 882, 996, and 1018 m/z were enriched in DS, while 810, 913, and 1519 m/z appeared more in RIF-R or MDR strains. The Random Forest model achieved an AUC of 0.786, with Logistic Regression and Decision Tree models showing similar performance (0.784 and 0.782, respectively).

Conclusions: This study demonstrates that MALDI-TOF lipid profiling, combined with machine learning, can differentiate DS from RIF-R or MDR Mtb strains based on distinct peak signatures, particularly in the 599, 810, and 1279 m/z regions.

Although lipid analysis requires several steps, it may serve as a rapid and informative complement to conventional DST, especially in cases of treatment failure or delayed response, ultimately supporting better clinical decision-making.

OA06-155-19 Diagnostic performance of Sanity 2.0 to detect resistance to rifampicin, isoniazid and fluoroquinolones among patients with TB

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Background: Effective tuberculosis (TB) management relies on prompt diagnosis of *Mycobacterium tuberculosis* (MTB) and timely detection of drug resistance to initiate optimum treatment regimens promptly. More molecular assay currently enables simultaneous detection of MTB and resistance to rifampicin (RIF), isoniazid (INH), and fluoroquinolones (FQ) are urgently needed. Sanity 2.0 is a novel integrated molecular test designed to address this gap. This study aimed to evaluate its diagnostic performance in clinical settings.

Design/Methods: Sanity 2.0 was evaluated using clinical specimens from patients with bacteriologically confirmed TB enrolled in two registered multicenter trials, INSPIRE (NCT05081401) and ORIENT (NCT 05401071). The sensitivity of Sanity 2.0 for MTB detection was evaluated. Sensitivity and specificity of Sanity 2.0 in detecting RIF, INH, and FQ resistance were assessed, using phenotypic drug susceptibility testing (pDST), whole-genome sequencing (WGS), Xpert MTB/RIF, and Xpert MTB/XDR as reference standards. Analyses were performed using R (version 4.3.1), with 95% confidence intervals (95% CI) calculated using the Wilson score methods.

Results: A total of 611 patients were recruited in this diagnostic study. MTB was detected in 563 of the specimens by Sanity 2.0, exhibiting a sensitivity of 92.1% (95% CI: 89.7–94.0) for detecting MTB. Taking the pDST results as the standard, the sensitivity for Sanity 2.0 detecting resistance to RIF, INH, and FQ was 100%, 91.7%, and 90.0%, respectively, with specificity of 85.3%, 95.9%, and 94.3%, respectively. Using NGS as reference, Sanity 2.0 achieved a 99.5% sensitivity for RIF resistance, 95.2% for INH, 93.6% for FQ, with specificity of 90.7%, 93.1%, 96.4%, respectively.

TABLE. Diagnostic performance of the Sanity 2.0 assay for detection of drug resistance compared with phenotypic drug susceptibility testing, whole-genome sequencing, Xpert MTB/RIF, and Xpert MTB/XDR assays.

Drug	Reference	No. of sample	No. of TP results	No. of FP results	No. of FN results	No. of TN results	Sensitivity(% [95% CI])	Specificity(% [95% CI])	Accuracy(% [95% CI])	PPV(% [95% CI])	NPV(% [95% CI])
RIF	pDST	201	183	19	0	110	100.0% (97.2 - 100.0)	85.2% (78.1 - 90.4)	94.5% (90.9 - 99.1)	90.5% (97.6 - 99.8)	96.5% (91.4 - 98.4)
INH	pDST	390	111	7	10	162	91.7% (85.5 - 95.5)	95.9% (90.7 - 98.0)	94.3% (87.5 - 93.8)	94.0% (90.5 - 98.4)	70.0% (70.0 - 85.8)
FQ	pDST	223	27	11	3	182	90.0% (74.4 - 96.5)	94.3% (90.1 - 96.8)	94.0% (90.4 - 96.6)	91.0% (83.5 - 95.4)	93.1% (91.7 - 97.2)
RIF	WGS	307	209	9	1	88	99.5% (97.4 - 99.9)	90.7% (83.3 - 95.0)	97.7% (95.9 - 99.3)	97.4% (91.2 - 99.8)	100.0% (99.6 - 100.0)
INH	WGS	327	159	11	8	149	95.2% (90.8 - 97.6)	93.1% (88.1 - 96.1)	94.1% (90.8 - 96.3)	94.1% (88.3 - 97.1)	94.2% (89.6 - 96.8)
FQ	WGS	308	98	10	4	206	91.6% (84.6 - 97.5)	96.4% (93.5 - 98.0)	95.1% (89.7 - 96.2)	71.1% (55.2 - 82.0)	98.4% (95.5 - 99.5)
RIF	Xpert-MTB/RIF	412	293	2	4	113	98.7% (96.6 - 99.7)	98.2% (93.8 - 99.5)	98.5% (96.1 - 98.2)	93.9% (92.3 - 97.8)	98.9% (93.9 - 99.8)
INH	Xpert-MTB/XDR	317	210	7	21	79	90.9% (86.5 - 94.0)	91.9% (84.1 - 96.0)	94.2% (91.1 - 96.1)	93.3% (88.8 - 96.4)	94.9% (90.3 - 97.4)
FQ	Xpert-MTB/XDR	315	81	8	15	234	87.1% (78.8 - 92.5)	96.7% (93.6 - 98.3)	93.9% (91.2 - 97.5)	85.3% (75.9 - 91.8)	98.5% (96.3 - 99.4)

RIF, rifampicin; INH, isoniazid; FQ, fluoroquinolones; pDST, phenotypic drug susceptibility testing; WGS, whole-genome sequencing; TP, true positive; FP, false positive; FN, false negative; TN, true negative; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value; CI, confidence interval.

Conclusions: Sanity 2.0 is a rapid, and user-friendly platform capable of detecting MTB and key drug resistance in a single step. It demonstrated good diagnostic performance and could potentially be an effective alternative as the initial test for rapid TB diagnosis and guiding individualized anti-TB treatment.

OA06-156-19 Improved internal quality control enhances accuracy of drug susceptibility testing in Eastern Europe and Central Asia

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Background: Accurate phenotypic drug susceptibility testing (pDST) is essential for tuberculosis (TB) treatment decisions. In 2019, Tajikistan's National Reference Laboratory (NRL) reported 55.9% false-resistant results for bedaquiline (Bdq).
We hypothesized that deviations in drug solution quality were not reliably detected using the WHO-recommended IQC based on a single critical concentration of M. tuberculosis H37Rv.
Design/Methods: Between 2018–2021, we implemented a harmonized MIC-based IQC protocol in four NRLs (Uzbekistan, Tajikistan, Kyrgyzstan, Ukraine) through on-site training and monitoring. MIC distributions were assessed using H37Rv (ATCC 27294) against multiple anti-TB drugs in BACTEC MGIT system. IQC was performed for each new drug solution lot using a 4-point MIC titration (mode ±1 and ±2). Equipment calibration and deviation response protocols were standardized. Data were analyzed to define reference MIC ranges and detect outliers.
Results: For Bdq, 75 IQCs showed a mode MIC of 0.25 mg/L in 80% of tests, with 97.3% within the 0.12–0.5 mg/L range. Other drugs (clofazimine, delamanid, linezolid, levofloxacin) showed similarly tight distributions. After MIC-based IQC implementation, re-testing of 129 isolates from Tajikistan NRL in 2022 showed 95.3% concordance with reference results, compared to 35% in 2019. False resistance dropped to 4.7%.
Conclusions: Our MIC-based IQC protocol provides a more discriminative and robust method to ensure pDST accuracy by detecting batch-specific errors in drug preparation.
The improved accuracy observed in partner laboratories supports the adoption of MIC-based IQC as a best practice, particularly for laboratories using new or repurposed anti-TB drugs. Global pDST quality assurance strategies should consider this approach.

OA06-157-19 Phenotypic drug susceptibility testing and genotypic characterization of Bedaquiline resistance among drug resistant *Mycobacterium tuberculosis* isolates

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Background: The new drugs bedaquiline, delamanid, and pretomanid have been approved for treating drug-resistant tuberculosis. The World Health Organization currently recommends the BPaL(M) regimen, which lasts 6-9 months, for managing drug-resistant tuberculosis.
This study aimed to perform phenotypic drug susceptibility testing (pDST) and identify mutations linked to bedaquiline (BDQ) resistance through whole genome sequencing (WGS).
Design/Methods: We conducted a prospective cohort study involving 298 drug-resistant Mycobacterium tuberculosis (MTB) isolates from patients visiting the respiratory medicine outpatient department at Christian Medical College, Vellore, and district TB centers across six districts in Tamil Nadu over the course of one year (2019-2023).
These isolates underwent phenotypic drug susceptibility testing (pDST) for bedaquiline using the BACTEC™ MGIT™ 960 system, following WHO guidelines. Additionally, whole genome sequencing (WGS) was performed on a subset of 150 isolates using the Illumina platform, followed by mutation analysis using BLASTIN.

Results: The study found a 7% prevalence of bedaquiline (BDQ) resistance. A total of 39 variants were identified across four candidate genes associated with BDQ resistance: Rv0678, mmpL5 (Rv0676c), pepQ, and Rv1979c. No mutations were observed in the Rv0677c, Rv1304, or atpE genes in any of the tested isolates. All isolates (100%) had at least one mutation in the Rv0676c gene.
Conclusions: This study identified the most common genetic variants linked to BDQ resistance from a tertiary care center in India. Larger studies across the country are necessary to explore the phenotypic and genotypic resistance profiles of BDQ and other drugs used in all-oral shorter regimens being introduced in India for the treatment of multidrug-resistant TB.

OA06-158-19 Determining the complete drug resistance pattern within a single day using a composite platform of BD-MAX™ MDR-TB and AmPORE TB with clinical samples

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Background: Rapid drug susceptibility testing is critical for initiating an effective anti-tuberculosis (TB) regimen. Typically, the initial sputum sample from a patient is entirely consumed for TB diagnosis, with results limited to rifampicin (RIF) and isoniazid (INH) resistance. Utilizing DNA extracted from the BD-MAX™ system for targeted next-generation sequencing (tNGS) circumvents the need for a second sputum sample, enabling same-day reflex testing for up to 16 antibiotics.
This study aims to evaluate the feasibility of using BD-MAX™-extracted DNA from clinical samples for resistance profiling via tNGS on the AmPORE TB platform and to determine an optimal cycle threshold (Ct) value for BD-MAX™ that supports further tNGS analysis.
Design/Methods: Seventy-four clinical bacteriological confirmed TB-positive sputum samples were processed using BD-MAX™ per manufacturer instructions. The 7 to 10 µl left-over extracted DNA were applied to tNGS using the AmPORE TB assay for tNGS. The number of resistance-associated gene regions detected and their corresponding BD-MAX™ Ct values were assessed.
Results: Of the 74 clinical samples, 14 (19%) failed or had a indeterminate result on BD-MAX™ and were excluded from analysis with tNGS. Of the 60 samples with positivetNGS successfully sequenced resistance-associated gene targets for at least 12 antibiotics with 37(61.7%) samples; 73.0% of these had a BD-MAX™ IS6110/IS1081 Ct value of ≤28.0. tNGS failed for only 8.3% of samples with Ct values of ≤28.0 to produce ARPs covering at least 12 antibiotics. The targets most frequently successfully sequenced with tNGS were for Inh, Rif, fluoroquinolones, Lzd, Pza, Eto, and second-line injectables (see Table 1).

Table 1: Antibiotics (AB) corresponding to genes that were detected with tNGS using BD-MAX DNA that met antibiotic cutoff criteria for clinical sputum samples

Antibiotic	Number of samples when gene region for antibiotics not detected (for samples where at least 12 AB were detected) Clinical Samples (n=37)	Number of samples when gene region for antibiotics not detected (for samples where at least 1 AB is detected) Clinical samples (n=46)
Isoniazid	0	3
Rifampicin	0	3
Ethambutol	3	11
Pyrazinamide	1	7
Levofloxacin	1	3
Moxifloxacin	1	3
Bedaquiline	1	7
Linezolid	0	3
Clofazimine	3	12
Pretomanid	4	12
Delamanid	4	11
Streptomycin	1	7
Amikacin	0	4
Capreomycin	2	9
Kanamycin	2	9
Ethionamide	0	3

Conclusions: Integrating BD-MAX™ with AmPORE TB tNGS enables comprehensive antibiotic resistance profiling with results reported within a single day. A Ct-value of 28 provides a strong prognosis of successful downstream tNGS testing. This protocol enhances laboratory capabilities to rapidly deliver reliable, comprehensive resistance data facilitating immediate initiation of effective TB treatment regimens.

OA06-159-19 Evaluation of the BD MAX™ and COBAS® platforms for the detection of *Mycobacterium tuberculosis* and resistance to rifampicin and isoniazid in Peru

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Background: In 2021, the World Health Organization (WHO) recommended the use of moderate-complexity automated nucleic acid amplification tests (NAATs) for the detection of tuberculosis (TB) and resistance to rifampicin and isoniazid. NAATs are molecular techniques employed to identify and amplify specific nucleic acid sequences.
The objective of this study is to evaluate the diagnostic performance of the BD MAX and Cobas platforms using clinical samples from Peru.
Design/Methods: Various sputum samples stored at the "Laboratorio de Referencia Nacional de Micobacterias" (LRNM) in Peru were analyzed. Initially, all specimens underwent testing with GeneXpert Ultra, LJ culture, or the Genotype MTBDRplus line probe assay, following routine standard protocols. The remaining stored aliquots

were subsequently utilized to perform the BD MAX™ and COBAS® assays. Sensitivity, specificity, repeatability, and intermediate precision were determined for both platforms in the detection of pulmonary tuberculosis and resistance to rifampicin and isoniazid. The evaluation of both platforms was carried out at different times and using distinct sets of samples.

Results: The sensitivity and specificity of both the BD MAX™ and COBAS® platforms for the detection of Mycobacterium tuberculosis (MTB) were 100%, with no discordant results observed between the two assays. For the detection of rifampicin resistance, COBAS® demonstrated 100% sensitivity and specificity.

In contrast, BD MAX™ showed a sensitivity of 92.1% and a specificity of 96.34%. Regarding isoniazid resistance, both platforms exhibited 100% specificity; however, sensitivity was 94.7% for BD MAX™ and 97.01% for COBAS® (*Table 1*). Repeatability and intermediate precision tests yielded satisfactory results for both diagnostic platforms.

			Detected	Not detected	Total	Sensitivity % (95% CI)	Specificity % (95% CI)
			XPERT MTB RIF Ultra				
MTB	BD MAX	Detected	18	0	30	100 (78.12 – 99.49)	100 (82.87 - 99.23)
		Not detected	9	12			
			Cultivo LJ				
	Cobas	Detected	80	0	150	100 (95.42 – 99.93)	100 (93.52 - 99.57)
		Not detected	9	70			
			LPA (GenoType MTBDRplus)				
RIF	BD MAX	Detected	35	3	120	92.1 (77.52 – 97.94)	96.34 (88.04 - 99.05)
		Not detected	3	79			
	Cobas	Detected	62	0	120	100 (78.12 – 99.49)	100 (59.87 - 99.23)
		Not detected	0	58			
INH	BD MAX	Detected	54	0	120	94.7 (84.45 – 98.83)	100 (91.73 - 99.83)
		Not detected	3	63			
	Cobas	Detected	65	0	120	97.01 (89.66 – 99.46)	100 (91.58 - 99.83)
		Not detected	2	53			

Table 1. Diagnostic accuracy of BD MAX™ and COBAS® platforms (MTB, RIF and INH) from sputum samples of Peruvian patients with tuberculosis, during 2024.

Conclusions: The BD MAX™ and COBAS® assays proved to be effective tools for the detection of *Mycobacterium tuberculosis* and associated resistance to rifampicin and isoniazid in clinical samples from Peruvian patients.

OA07 Diagnosing and treating drug-resistant TB

OA07-160-19 Whole genome sequencing for new and repurposed anti-tuberculosis drugs among people with drug-resistant TB in the Philippines

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Background: New anti-tuberculosis drugs developed in the past decade, combined with repurposed medications, have led to shorter, safer, and more effective regimens for treating multidrug-resistant TB (MDR-TB). Bedaquiline was fully rolled out in the Philippines in 2020, followed by the shortened BPaL/BPaLM regimens in December 2023. However, resistance to these drugs can emerge quickly and spread through transmission.

Design/Methods: We examined the prevalence and genomic correlates of resistance to new and repurposed anti-tuberculosis drugs in the Philippines using whole genome sequencing. We used baseline isolates from people newly enrolled in MDR-TB treatment during April 2019- April 2022 from Cavite province. Mycobacterium tuberculosis (MTB) strain lineage and genomic correlates of drug resistance were determined using whole genome sequence (WGS) analysis. MTB DNA was sequenced using paired-end WGS on the NovaSeq 6000, followed by bioinformatics analysis.

Results: Among 148 people with MTB genomic data, mean age was 43.6 years (SD± 14.6) and 72% were male. Lineage distribution showed 88% were lineage 1.2.1, 10% were lineage 4, and 2% were lineage 2. Only one (0.7%) had fluoroquinolone resistance (gyrA_D94G) and three (2%) had bedaquiline resistance (Rv0678). Isoniazid resistance mutations were found in 42% (62/148) of isolates, mainly katG_315T (55/62, 89%). Rifampicin resistance mutations were detected in 84%, primarily rpoB_S450L (68/125, 54%) and rpoB_H445Y (23/125, 18%). No WHO-graded resistance conferring mutations were found for delamanid, linezolid and pretomanid.

Conclusions: Resistance to new and repurposed anti-TB drugs remains low in the Philippines. Continued use of fluoroquinolones appears safe as resistance has remained low despite its programmatic use for MDR-TB since 2000. The high frequency of katG mutations suggests that high-dose isoniazid may not be suitable in MDR-TB regimens in the Philippines.

OA07-161-19 Targeted Nanopore sequencing for early detection of heteroresistance in *Mycobacterium tuberculosis*

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Background: Heteroresistance, the co-existence of drug-resistant and drug-sensitive *Mycobacterium tuberculosis* (*M. tb*) strains, can lead to treatment failure, relapse, and resistance amplification. GeneXpert MTB/RIF Ultra may have low sensitivity for minority-resistant strains and does not report heteroresistance. Targeted sequencing may detect heteroresistance missed by routine diagnostics.
We compared GeneXpert Ultra and targeted Nanopore sequencing on samples spiked with H37Rv and multi-drug-resistant TB (MDR-TB) to quantify detection limits.
Design/Methods: We designed a 5'FAM- and 3'BHQ1-labeled molecular beacon probe targeting the *RD9* gene of *M. tb* for qPCR-based DNA quantification. A targeted Nanopore panel was developed to detect *rpoB, katG,* and *inhA* mutations linked to drug resistance. MDR strains were spiked into H37Rv at 10^6-10^2 dilutions. GeneXpert MTB/RIF Ultra cartridges were spiked with H37Rv:MDR at seven ratios (95:5, 90:10 to 40:60). Spiked ratios (99.5:0.5, 99:1, 95:5 to 40:60) at 10^6-10^2 dilutions were sequenced on MinION MK1c (R10.4.1, Q-score ≥9). In-house pipelines calculated coverage depth, performed variant calling, and analyzed heteroresistance.
Results: The targeted Nanopore panel showed 100% concordance with Illumina WGS in variant calling. High coverage depths were achieved for all markers, with a median of 17,359x (IQR: 11,162x–24,458x). GeneXpert MTB/RIF Ultra detected rifampicin resistance at ≥20% in 10^6–10^5 copies, ≥30% in 10^4 copies, but failed at 40% in 10^3 copies. Heteroresistance was undetected at 10^2 copies. Nanopore sequencing identified mutant alleles at all dilutions, including 0.5% frequency in 100 copies, with a median coverage depth of 438x, exceeding the 10x cutoff for accurate variant detection.

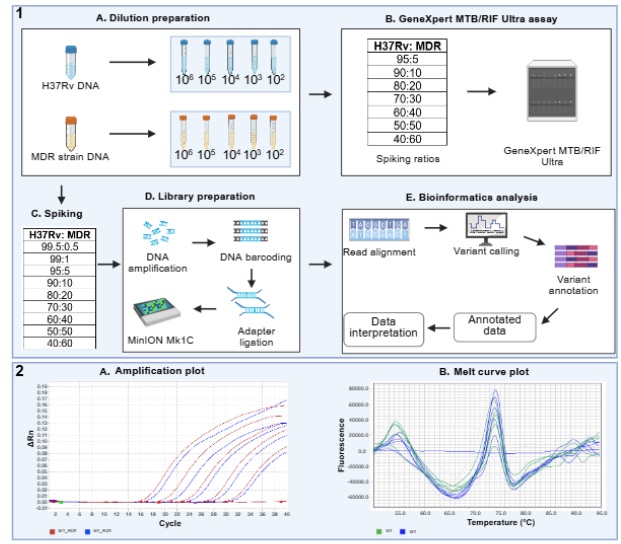

Figure: 1. Workflow schema for assessing heteroresistance in *M.tb* using GeneXpert MTB/RIF Ultra and targeted nanopore sequencing. **2.** Amplification plot and melt-curve plot obtained from the molecular beacon-based qPCR assay.

Conclusions: This study highlights the need for sensitive molecular diagnostics for early heteroresistance detection in *M. tb*. While GeneXpert MTB/RIF Ultra misses heteroresistance, Nanopore sequencing identified low-frequency resistant mutations, providing a cost-effective, scalable detection tool.

OA07-162-19 Assessing the performance of culture-free next generation sequencing for drug-resistant tuberculosis detection

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Background: Targeted Next-Generation Sequencing (tNGS) of *Mycobacterium tuberculosis* (MTB) was approved by WHO for drug-resistant tuberculosis (DR-TB) diagnosis from respiratory samples. The new Deeplex Myc-TB XL (Genoscreen) provides extended target panel, including bedaquiline and pretomanid, matching the modern DR-TB treatment regimens. Still, whole-genome sequencing (WGS) may be preferred as it doesn't require target preselection and supports epidemiological surveillance. The new QIAseq xHYB MTB panel (Qiagen) enables whole-genome hybridization enrichment for direct WGS (dWGS) testing.
We investigated the limit of detection (LoD) and performance of tNGS and dWGS on 89 sediments from MTB-positive sputum samples collected within a TB vaccine trial with prevention of recurrence design.
Design/Methods: Ultra-Deep Microbiome Prep (Molzym) was used for DNA extraction and host DNA depletion. Real-time PCR was used to quantify MTB genome

copies (gc). Deeplex and QIAseq libraries were sequenced on Illumina systems. FASTQ files were analyzed using adapted MTBseq pipeline for detecting mutations relevant for drug resistance (DR) that were compared to WGS from corresponding isolates.

Results: Study samples showed broad quantification ranging from 1-10 (Ct 31-34), 10-100 (Ct 28-31), 100-1000 (Ct 25-28) to >1000 (Ct <25) gc/uL. Deeplex led to interpretable profiles for 86/89 (97%) samples (Ct 28.5±3.2).

Three samples had coverage depth <200x (Ct 32.6±2.8). QIAseq showed high quality dWGS (depth >30x, breadth >97%) for 53/89 (60%) samples (Ct 27.4±2.5), allowing transmission analysis.

Twelve samples (Ct 30.5±2.1) showed acceptable metrics (depth >20x, breadth >90%), whereas remaining (Ct 30.3±4.1) resulted in incomplete genome data.

Both assays demonstrated high (>98%) sensitivity and specificity for DR detection.

Conclusions: Culture-free dWGS allowed successful DR interpretation for 74% specimens. However, tNGS showed lower LoD (10 vs >100 total gc of dWGS) and stronger correlation with bacillary load.

Selecting between the two approaches based on bacillary loads would enable effective direct diagnostic sequencing from patient samples.

OA07-163-19 Multicentre study on the Mycobacterium tuberculosis H37Rv reference strain using a new EUCAST-AMST reference protocol developed for MIC-determination of bedaquiline, clofazimine, delamanid and pretomanid

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Background: A multicentre study with nine EUCAST-AMST (European committee on antimycobacterial susceptibility testing) laboratories and the BD Microbiology R&D laboratory was performed using the new reference protocol developed by the EUCAST-AMST to test water-insoluble antituberculous drugs (ATTB). Bedaquiline (BDQ), clofazimine (CFZ), delamanid (DLM) and pretomanid (PA) MICs were determined to set the modal and MIC ranges of the M. tuberculosis (MTB) H37Rv strain.

Design/Methods: The ATTB stock solutions were prepared in 100% DMSO. The final DMSO concentration was 0.5 % in the broth microdilution assay. The MTB H37Rv strain was tested following the new EUCAST reference protocol. Test concentrations were for BDQ 0.008-1 mg/L, CFZ 0.016-2 mg/L, DLM 0.0005-0.06 mg/L and PA 0.016-2 mg/L. MIC was interpreted at the point both drug-free growth controls (GC100% and GC1%) were positive.

Results: For BDQ 175 MICs were generated, for CFZ 119, for DLM 252 and for PA 216. The MIC distribution range was 0.016-0.06 mg/L for BDQ, 0.06-1 mg/L for CFZ, 0.001-0.03 mg/L for DLM and 0.03-0.25 mg/L for PA. The

modal MIC was 0.03, 0.5, 0.004 and 0.12 mg/L for BDQ, CFZ, DLM and PA, respectively. The intra-laboratory reproducibility was high for BDQ (6/6 laboratories), DLM (8/9 laboratories) and PA (9/9 laboratories) with MICs within ± one dilution for >95% of observations, but lower for CFZ. Correspondingly, inter-laboratory reproducibility was high for BDQ (6/6 laboratories) but lower for DLM (6/9 laboratories), PA (7/9 laboratories) and CFZ (2/4 laboratories).

Conclusions: Ten laboratories, including nine within EUCAST-AMST, tested the MTB H37Rv strain with the new EUCAST reference protocol for MIC determination of water-insoluble ATTB. For most drugs, intra-laboratory reproducibility was high while inter-laboratory reproducibility was generally lower, but still with a well-defined modal MIC with ± one dilution range for BDQ, DLM and PA determined.

OA07-164-19 Baseline and acquired resistance-associated M. tuberculosis variants in BPaL-based regimens

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Background: TB-PRACTECAL studied 24-week treatments consisting of bedaquiline, pretomanid and linezolid (BPaL), BPaL plus moxifloxacin (BPaLM) and BPaL plus clofazimine (BPaLC) for RR/MDR-TB in Uzbekistan, Belarus, and South Africa.

Design/Methods: Mycobacterium tuberculosis drug susceptibility testing (DST) (n=470) and minimum inhibitory concentration (MIC) (n=467) by BD-BACTEC™MGIT™ and whole genome sequence (WGS) (n=424) data were used to investigate the rates of baseline-resistance (BR) and acquired-resistance (AR) to moxifloxacin, bedaquiline, clofazimine, linezolid and pretomanid.

Results: At baseline, 62.8% were phenotypically MDR-TB, 4.9% RR, 18.3% Pre-XDR, and 0.9% XDR. The lineages observed were 72% Lineage2, 22% Lineage4, 0.9% Lineage3 and 0.7% Lineage1.

No BR was detected against linezolid, pretomanid or clofazimine. Moxifloxacin BR was detected in 19.6%(n=92/470), 70 of which showed low-level resistance (0.25<MIC ≤1mg/L). Bedaquiline BR was detected in 5/467 cases; one in South Africa caused by a known frame-shift mutation in mmpR5 (c.144dupC), and four in Uzbekistan, all with SNPs in mmpR5, of which three had a novel SNP p.Gly41Val.This novel SNP was detected five times, four baseline and one corresponding post-baseline sequence, all but one baseline isolate had an MIC=2mg/L (resistant). Of the bedaquiline BR cases, two completed treatment, one with BPaL and one with BPaLC and both had a successful clinical outcome; the other three were withdrawn due to resistance.

No AR to moxifloxacin, linezolid or pretomanid was observed. There were two cases of AR to bedaquiline/clofazimine; in one case a subpopulation (16%) emerged at week 41 with a frameshift in mmpR5 (c.138_139dupTG); in the other case AR to bedaquiline and clofazimine was observed phenotypically at week 54 but no sequence data was available. Both cases were relapses in the BPaL arm.

Conclusions: Baseline-resistance rates to all drugs in the BPaL-based regimens, except moxifloxacin, were very low. Acquired resistance was observed to bedaquiline and clofazimine, albeit at very low rates.

OA07-165-19 Association between pre-diagnostic fluoroquinolone exposure and acquired fluoroquinolone resistance in *Mycobacterium tuberculosis* in Shanghai, China: An EHR-based case-control study using whole-genome sequencing

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Background: Fluoroquinolones (FQ) occupy a dual role in global health as both essential second-line antituberculosis (TB) agents and the most prescribed broad-spectrum antibiotics worldwide. However, the association between pre-diagnostic FQ exposure and acquired FQ-resistant TB has yet to be explored.

Design/Methods: This was a retrospective case-control study involving all culture-confirmed pulmonary TB cases reported in Shanghai, China from January 2022 to December 2023. Acquired FQ-resistant TB cases were identified through whole-genome sequencing (WGS) and compared with FQ-susceptible TB controls, which were randomly selected at a 1:1 ratio. Information regarding pre-diagnosis FQ exposure within 12 months prior to the TB diagnosis, was retrieved from the Shanghai Electronic Health Record (EHR) platform.

Results: FQ resistance was detected in 7.4% (260/3496) of all TB cases, with 93.5% (243/260) classified as acquired resistance. Among the patients with acquired FQ resistance, 17.3% (42/243) had received single FQ prescriptions and 42.0% (102/243) had received multiple prescriptions prior to TB diagnosis.

A multivariate logistic regression model revealed FQ exposure as the strongest resistance predictor: single prescription (aOR=4.31, 95% CI=2.37-8.04) and multiple

prescriptions (aOR=13.18, 95% CI=7.72-23.45). Restricted Cubic Splines (RCS) analysis illustrated a nonlinear dose-response relationship (Nonlinear: $P<0.0001$), with the probability of resistance increasing monotonically with the number of prescriptions.

Among the 784 FQ prescriptions dispensed to 144 FQ-exposed acquired FQ-resistant patients, prescriptions retrieved from non-designated tertiary hospitals for non-TB respiratory diseases, with an exposure interval of ≥61 days prior to TB diagnosis, were more prevalent in the FQ-resistant group (19.8%, 155/784, $P< 0.05$).

Characteristics	FQ-susceptible (N=243)	Acquired FQ-resistant (N=243)	OR (95% CI)	P value	aOR (95% CI)	P value
Treatment classification						
Treatment-naive	224 (92.2)	205 (84.4)	Ref		Ref	
Previously treated	19 (7.8)	38 (15.6)	2.19 (1.24,3.99)	0.009	1.52 (0.74,3.14)	0.254
Lineage						
Non-Beijing	37 (15.2)	18 (7.4)	Ref		Ref	
Beijing	206 (84.8)	225 (92.6)	2.25 (1.26,4.15)	0.008	2.15 (1.08,4.42)	0.033
Rifampicin						
Susceptible	229 (94.2)	188 (77.4)	Ref		Ref	
Resistant	14 (5.8)	55 (22.6)	4.79 (2.65,9.20)	<0.001	7.16 (3.71,14.58)	<0.001
FQ exposure						
No FQ prescription	201 (82.7)	99 (40.7)	Ref		Ref	
Single FQ prescription	21 (8.6)	42 (17.3)	4.06 (2.31, 7.34)	<0.001	4.31 (2.37,8.04)	<0.001
Multiple FQ prescriptions	21 (8.6)	102 (42.0)	9.86 (5.92, 17.09)	<0.001	13.18 (7.72,23.45)	<0.001

Table. Univariate and multivariate logistic regression on the risk factors of acquired FQ-resistance

Conclusions: A worrisome prevalence of FQ resistance among all TB cases in Shanghai, China was demonstrated, predominantly driven by acquired resistance. The dose-response relationship between pre-diagnostic FQ exposure and acquired resistance underscores the imperative need for judicious FQ use especially in respiratory infection therapy.

OA07-166-19 Baseline resistance to new and repurposed anti-TB drugs in the endTB-Q clinical trial

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Background: The endTB-Q trial (NCT03896685) included 324 participants with pulmonary, rifampin-resistant, fluoroquinolone-resistant tuberculosis (pre-XDR-TB), who were randomized to the WHO standard regimen for pre-XDR-TB or a 6-9 month experimental regimen.

Design/Methods: Minimum-inhibitory-concentrations (MICs) for bedaquiline (BDQ), linezolid (LZD), delamanid (DLM), and clofazimine (CFZ) were determined using broth microdilution (BMD). Phenotypic resistance (pR) was defined as an MIC greater than the critical concentration (CC). Whole-genome-sequencing (WGS) was performed on the Illumina platform. Genotypic resistance (gR) was defined as a WHO Category 1 or 2 resistance-associated mutation present at ≥3% allele frequency and mutations were classified as major/minor based on frequencies.

Results: Of the 324 participants, 266 (82.1%) had both baseline MIC and WGS data. Resistance to at least one drug was detected in 48 isolates (18.0%), with 19 (7.1%) showing both pR and gR. The highest overall resistance by any method was observed for CFZ (6.7%), followed by BDQ (4.9%), DLM (3.3%), and LZD (3.0%). The proportion of isolates showing both pR and gR was the highest for LZD (2.6%), followed by CFZ (2.2%), BDQ (1.9%), and DLM (0.8%). Isolates with pR-alone were most frequently seen with CFZ (4.5%), then DLM (2.6%), BDQ (1.9%), and LZD (0.4%).

Genotypic-only resistance was observed only for BDQ (1.1%). Most gR was due to major/fixed mutations; overall, minority variants were more common in BDQ- and

CFZ-resistant isolates. All LZD gR variants were fixed. Isolates from India (7.5%, gR+pR) and Pakistan (6.6%, gR+pR) had relatively high resistance rates; notably, all LZD-resistant isolates originated from India.

Drug	Resistant by	IN (n=119)	PK (n=90)	VN (n=22)[1]	PE (n=19)[1]	KZ (n=16)[1]	Total (n=266) (pR+gR)/ pR-only/ gR-only	Total (n=266) (pR+gR)+pR-only+gR-only
BDQ	pR+gR	1 (0.8%)[2]	2 (3.3%)[4]	1 (4.5%)[3]	0 (0%)	1 (6.25%)[3]	5 (1.9%)	13 (4.9%)
	pR only	0 (0%)	5 (5.5%)	0 (0%)	0 (0%)	0 (0%)	5 (1.9%)	
	gR only	0 (0%)	0 (0%)	0 (0%)	2 (10.5%)[3]	1 (6.25%)[2]	3 (1.1%)	
LZD	pR+gR	7 (5.8%)[3]	0 (0%)	0 (0%)	0 (0%)	0 (0%)	7 (2.6%)	8 (3.0%)
	pR only	1 (0.8%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (0.4%)	
	gR only	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
DLM	pR+gR	0 (0%)	2 (2.2%)[4]	0 (0%)	0 (0%)	0 (0%)	2 (0.8%)	9 (3.3%)
	pR only	4 (3.3%)	3 (3.3%)	0 (0%)	0 (0%)	0 (0%)	7 (2.6%)	
	gR only	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
CFZ	pR+gR	1 (0.8%)[2]	2 (2.2%)[4]	1 (4.5%)[3]	0 (0%)	2 (12.5%)[4]	6 (2.2%)	18 (6.7%)
	pR only	5 (4.2%)	5 (5.5%)	1 (4.5%)	0 (0%)	1 (6.25%)	12 (4.5%)	
	gR only	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
Total	pR+gR	9 (7.5%)	6 (6.6%)	2 (9%)	0 (0%)	2 (12.5%)	19 (7.1%)	48 (18.0%)
	pR only	10 (8.4%)	13 (14.4%)	1 (4.5%)	0 (0%)	1 (6.25%)	25 (9.3%)	
	gR only	0 (0%)	0 (0%)	0 (0%)	2 (10.4%)	1 (6.25%)	3 (1.1%)	

pR+gR: Resistance detected by both phenotypic and genotypic methods (Category 1 or 2 mutations present as per WHO mutation catalogue V2.0 + MIC > CC)
pR only: Phenotypic resistance only, MIC > CC gR only: Genotypic resistance only, Category 1/2 mutations present as per WHO mutation catalogue V2.0
[1] Small sample sizes, interpret with caution
[2] Minority: <50% allele frequency of resistance associated mutation
[3] Majority-fixed: >50% allele frequency of resistance associated mutation, fixed: 100% allele frequency
[4] One strain with majority and the other with minority drug-resistant populations
IN: India, PK: Pakistan, VN: Vietnam, PE: Peru, KZ: Kazakhstan, BDQ: bedaquiline, CFZ: clofazimine, LZD: linezolid, DLM: delamanid

Conclusions: These findings highlight the importance of baseline drug susceptibility testing, particularly in high resistance-prevalent settings. pR without gR may suggest gaps in our understanding of resistance mechanisms to new and repurposed anti-TB drugs. Minority variants may indicate early emergence of resistance, underscoring the need for rapid, sensitive diagnostics prior to treatment.

OA07-167-19 Baseline and emergent phenotypic pretomanid resistance in RR/MDR-TB patients in KwaZulu-Natal: Findings from the ADAP-TIV trial

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Background: Bedaquiline and pretomanid have revolutionized treatment for rifampin-resistant/multidrug-resistant tuberculosis (RR/MDR-TB), but escalating drug resistance threatens their durability within RR/MDR-TB regimens. We evaluated baseline and treatment-emergent resistance to these drugs in a high-burden setting.

Design/Methods: ADAP-TIV is an adaptive, randomized clinical trial of adherence-support strategies in adults with RR/MDR-TB initiating treatment within a programmatic setting in KwaZulu-Natal, South Africa.

We analyzed phenotypic drug susceptibility testing (pDST) data of consecutively enrolled participants, focusing on those with culture-confirmed *Mycobacterium tuberculosis* (MTB) in the trial-designated laboratory.

MTB positivity was defined by growth in MGIT or solid media. Baseline resistance was assessed on a pre-treatment sputum sample, while emergent resistance was defined by new resistance in any sputum sample after treatment initiation. The critical concentration was defined at 0.25 μg/mL on 7H11 media for bedaquiline.

A conservative critical concentration for pretomanid of 0.25 μg/mL on 7H11 was assumed based on the lower WHO concentration for resistance in MGIT and published MGIT:7H11 MIC ratios. MGIT MIC testing and whole genome sequencing are in process.

Results: 357 consecutive RR/MDR-TB patients were screened, and 158 participants were enrolled. 93 (59%) had a positive MTB culture at baseline. Among these, 3 (3.2%) had baseline phenotypic resistance to pretomanid and 3 (3.2%) to bedaquiline; none had prior exposure to these drugs. Treatment-emergent resistance to pretomanid and bedaquiline (dual resistance) occurred in 2/29 (6.9%) participants with persistent culture positivity.

Timepoint	MTB-Positive Isolates n	Pretomanid Resistant n (%)	Bedaquiline Resistant n (%)	Dual Resistance n (%)
Baseline	93	3 (3.2%)	3 (3.2%)	1 (1.1%)
Month 2 or later	29	2 (6.9%)	2 (6.9%)	2 (6.9%)

Conclusions: Baseline and treatment-emergent resistance to bedaquiline and pretomanid were identified among patients receiving programmatic treatment for RR/MDR-TB with no prior exposure to these drugs. These results underscore the importance of upfront resistance detection to inform clinical decisions on drug selection and ongoing surveillance for resistance to novel drugs to guide public health responses. Routine, rapid phenotypic drug susceptibility testing for these novel agents is essential, especially in high RR/MDR-TB burden settings.

OA07-168-19 Bedaquiline, pretomanid, and linezolid resistance among rifampicin-resistant *M. tuberculosis* strains in South Africa

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Background: The introduction of bedaquiline and pretomanid in combination with linezolid (BPaL) has transformed the fight against drug-resistant tuberculosis (DR-TB). We sought to characterize emerging resistance to this drug regimen in South Africa, which would pose a major obstacle for continued progress against DR-TB.
Design/Methods: All rifampicin-resistant *Mycobacterium tuberculosis* isolates programmatically underwent phenotypic drug-susceptibility testing (DST) for bedaquiline and linezolid; a subset also underwent DST for pretomanid. We conducted a prospective study of isolates from KwaZulu-Natal, Gauteng, Eastern Cape, and Free State provincial labs that were resistant by DST to any BPaL drug from 2023–2025. Enrolled isolates underwent minimum inhibitory concentration (MIC) testing for BPaL drugs and whole genome sequencing (WGS).
Results: We enrolled isolates from 456 individuals and obtained WGS from 339. Lineages 2 and 4 dominated. Sublineage 2.2.2 accounted for 31.6% (n=107) of all isolates and 64.8% of Eastern Cape isolates. At a 12 SNP cut-off, 44.5% (n=151) were clustered into 40 transmission clusters; 83 isolates in 33 clusters (24.5%) had identical *mmpR5* mutations. MIC results were available for 309 isolates; 273 (88.3%) were bedaquiline-resistant, 38 (12.3%) were linezolid-resistant, and 49 (15.9%) were pretomanid-resistant. 22.3% (69/309) of isolates were resistant to multiple BPaL drugs; 35 were resistant to bedaquiline and pretomanid, 27 were resistant to bedaquiline and linezolid, and 7 were resistant to all three.
We observed high-level phenotypic resistance in 3.3% of bedaquiline-resistant and 2.6% of linezolid-resistant strains (≥8µg/mL), as well as 35.4% of pretomanid-resistant strains (≥16µg/mL).
We identified 110 bedaquiline resistance-conferring mutations, mostly in *mmpR5* (n=99). The most common (65/273) was *mmpR5* E49fs. Among linezolid-resistant isolates, the most common resistance-conferring mutation was *rplC* C154R. No dominant mutation was detected among pretomanid-resistant isolates.

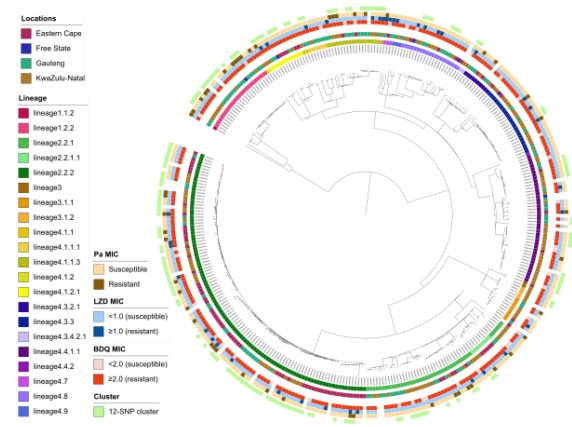

Figure: Phylogenetic tree of 339 study isolates. Drug resistance to bedaquiline (BDQ) was defined as MIC ≥2 µg/mL; resistance to linezolid (LZD) was defined as MIC ≥1 µg/mL; resistance to pretomanid (Pa) was defined as MIC ≥2 µg/mL for Lineage 1 isolates and MIC ≥0.5 µg/mL for Lineage 2, 3, or 4 isolates. All MIC testing was conducted using the MGIT method.

Background and challenges to implementation: The introduction of bedaquiline and pretomanid in combination with linezolid (BPaL) has transformed the fight against drug-resistant tuberculosis (DR-TB). We sought to characterize emerging resistance to this drug regimen in South Africa, which would pose a major obstacle for continued progress against DR-TB.
Intervention or response: All rifampicin-resistant *Mycobacterium tuberculosis* isolates programmatically underwent phenotypic drug-susceptibility testing (DST) for bedaquiline and linezolid; a subset also underwent DST for pretomanid. We conducted a prospective study of isolates from KwaZulu-Natal, Gauteng, Eastern Cape, and Free State provincial labs that were resistant by DST to any BPaL drug from 2023–2025. Enrolled isolates underwent minimum inhibitory concentration (MIC) testing for BPaL drugs and whole genome sequencing (WGS).
Conclusions: Among the studied isolates, nearly a quarter were phenotypically resistant to multiple drugs within the BPaL regimen. Transmission of bedaquiline-resistant strains warrants particular attention.

OA07-169-19 When treatment options narrow: Management of bedaquiline-resistant tuberculosis in Uzbekistan

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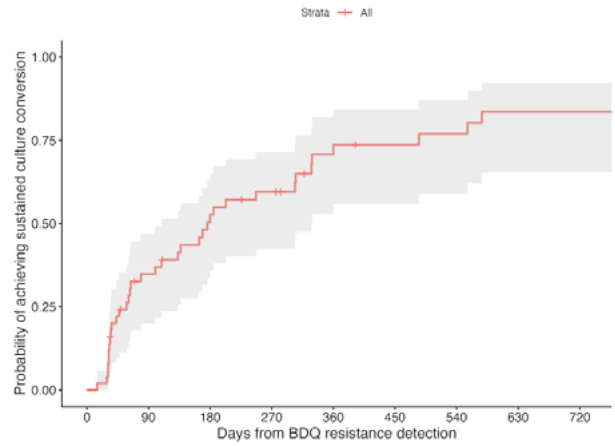
Background: Bedaquiline resistance is increasing globally, threatening effectiveness of short regimens for rifampicin-resistant tuberculosis. Limited data exist describing management strategies and clinical outcomes among people with bedaquiline-resistant tuberculosis.
Design/Methods: We did a retrospective cohort study of patients with bedaquiline-resistant tuberculosis in Karakalpakstan, Uzbekistan, from January 2017 until December 2024. Clinical and laboratory records were reviewed to describe drug resistance profiles, treatment regimens, and sputum culture results.
To characterise clinical outcomes, we measured time to sustained sputum culture conversion (SCC), and the proportion of patients who had tuberculosis-free survival (alive, and had completed treatment or were in care, and had SCC) 18 months after bedaquiline resistance was detected.
Results: We identified 56 patients with bedaquiline-resistant tuberculosis - 50 (89%) received treatment after resistance detection, and six (11%) did not, of whom four (67%) were known to have subsequently died.
Of those starting treatment, the median age was 41 years (interquartile range [IQR]=27-52), 32/50 (64%) were male, 29/50 (58%) were underweight (body mass index <18.5kg/m^2), 35/50 (70%) had fluroquinolone resistance, and 16/50 (32%) had not previously received bedaquiline.
The median treatment duration after bedaquiline resistance detection was 18 months (IQR=8.9-22), with bedaquiline prescribed for 42/50 (84%) patients for a median 5.6 months (IQR=2.2-13), imipenem for 33/50 (66%) for a median 8.1 months (IQR=4.4-11), amikacin for 25/50 (50%) for a median 7.9 months (IQR=4.4-11), and linezolid for 48/50 (96%) for a median 16 months (IQR=7.8-20). The median time to SCC was 176 days (IQR=58-485) (Figure).
Of 43 patients who had an assessable 18-month outcome, 24/43 (56%) had tuberculosis-free survival. 7/43 (16%) were alive and in care without SCC, 10/43 (23%) died, and 2/43 (4.7%) were lost to follow-up.



Conclusions: Management of bedaquiline-resistant tuberculosis in Uzbekistan required prolonged therapy, often with injectable agents, resulting in delayed culture conversion and poor clinical outcomes.

OA07-170-19 Safety and efficacy of an adaptive injectable-containing regimen for RR-TB: Results from the SHOORT trial in Niger

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Background: WHO recommends all-oral bedaquiline- and linezolid (LZD)-containing regimens for rifampicin-resistant tuberculosis (RR-TB). In Niger, high cure rates were previously achieved using an adaptive short treatment regimen (aSTR), with a second-line injectable drug (SLID) and LZD, where LZD replaced the SLID upon detection of ototoxicity with audiometric monitoring at baseline or during treatment. We evaluated the safety and efficacy of an all-oral (oSTR) versus aSTR in the SHOORT trial.
Design/Methods: Pragmatic trial, patients with fluoroquinolone-susceptible RR-TB were alternately assigned by alternate months to oSTR or aSTR (coin toss determined which regimen to be used first). Regression models

estimated the association between safety (grade 3-4 adverse events [AEs]) and efficacy (excluding loss to follow-up) of both treatment approaches.

Results: From April 2021 to December 2023, 296 patients (161 oSTR, 135 aSTR) were included. Baseline characteristics were balanced. In the aSTR group, 80/135 (59.3%) were switched to LZD due to baseline (n=60) or emerging (n=20) ototoxicity.

For the 20 patients with emergent ototoxicity, the median SLID duration before the switch was 2 months (IQR:1–3).

Grade 3–4 AEs occurred in 45/161 (28.0%) of oSTR vs. 18/135 (13.3%) aSTR patients (OR 2.90; 95%CI:1.55–5.65).

Anaemia (27 of 75 severe AEs), neurotoxicity (19), and hepatotoxicity (17) were more frequent with oSTR, while aSTR was associated with mild ototoxicity (grade 2 only) and nephrotoxicity (only one grade 3 case).

In the efficacy population, treatment success was comparable (79.0% [117/148] vs. 83.0% [103/124]; difference, 4.0%; 95%CI: -13.3-5.3; p= 0.4).

Unfavourable outcomes (death, treatment failure or relapse) occurred in 31 oSTR (27 deaths, 3 failures and 1 relapse) vs. 21 aSTR (19 deaths and 2 relapses) patients, with older age, HIV positivity, female sex, and low BMI increasing risk.

Safety population§	oSTR N = 161	aSTR N = 135	p-value
Severe grade 3-4 AE	45 (28.0%)	18 (13.3%)	0.002
Efficacy population	oSTR N = 148	aSTR N = 124	p-value
Favorable outcomes	45 (79.05%)	103 (83.06%)	0.7
Unfavorable outcomes	31 (20.9%)	21 (16.9%)	
Of which			
Died	27 (18.2%)	19 (15.3%)	
Failure	3 (2.0%)	0 (0.0%)	
Relapse	1 (0.6%)	2 (1.6%)	

§22 excluded: 21 losses to follow-up (10 oSTR, 11 aSTR) and 1 fluoroquinolone resistance detected a posteriori (oSTR)

Abbreviations: oSTR: all-oral bedaquiline linezolid containing short treatment regiment, aSTR: adaptive short treatment regimen, AE: adverse event.

Table 1: Safety and efficacy results of an all-oral versus an adaptive short treatment regimen

Conclusions: Short-term use of SLID with audiometric monitoring and selective LZD substitution is safer than long-term LZD exposure, without compromising efficacy.

OA08 Preventing TB by addressing the gap

OA08-171-19 Risk of immunological sensitisation to *MTB* and progression to incident TB disease in a high-burden setting

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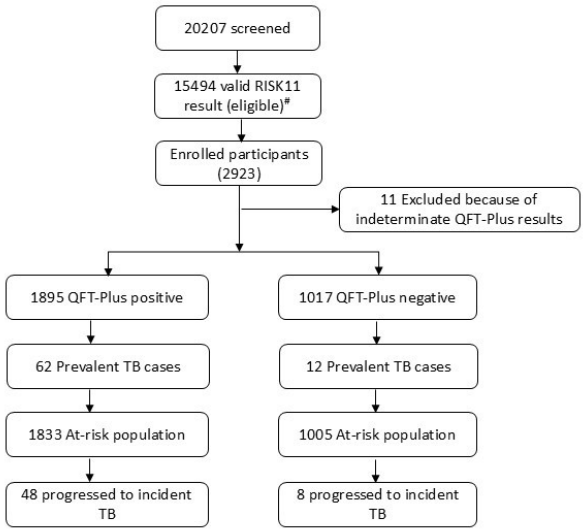
Background: Studies have shown that individuals immunologically sensitised to *Mycobacterium tuberculosis* (*Mtb*) have increased risk of progression to incident tuberculosis (TB) disease. We evaluated risk factors for *Mtb* sensitisation and progression to TB disease in a TB-endemic setting.

Design/Methods: Healthy HIV-uninfected adults (18-60 years) enrolled at five high TB incidence sites in South Africa were prospectively evaluated for *Mtb* immunological sensitisation with baseline QuantiFERON-TB Gold-plus. Participants were screened for microbiologically-confirmed TB (sputum liquid culture and/or Xpert Ultra positive) at baseline and during 15 months follow-up.

Multivariable logistic and Cox regression were used to evaluate risk factors for *Mtb* immunological sensitisation and progression to TB disease, respectively. Point estimates were adjusted with sampling weights to represent the screened population.

Results: Among 2912 participants evaluated, 63.4% (1895/2912) were *Mtb*-sensitised, of whom 1.8% (62/1895) had prevalent TB at baseline; 2.0% (48/1833) of those without prevalent TB progressed to incident TB. Among 1017 individuals who were not *Mtb*-sensitized, 0.6% (12/1017) had prevalent TB; 0.5% (8/1005) of those without prevalent TB progressed to incident TB (Figure 1). Risk factors for *Mtb*-sensitisation were increasing age (odds ratio; OR=1.02 per year, 95%CI 1.01-1.03), male sex (OR=1.34, 95%CI 1.08-1.67), smoking history (OR=1.31,

95%CI 1.05-1.64), prior TB (OR=2.20, 95%CI 1.40-3.47), and TB contact history (OR=1.4, 95%CI 1.08-1.83). *Mtb*-sensitisation (hazard ratio; HR=3.13, 95%CI 1.17-8.39) and smoking history (HR 2.34, 95%CI 1.03-5.29) were risk factors for TB progression; increasing body-mass index (BMI, kg/m^2; HR=0.89, 95%CI 0.82–0.97) was a protective factor.



Enrolment into the study was based on RISK11 status. RISK11 is an 11-gene signature for TB risk

Figure 1: Study flow diagram

Conclusions: Compared to individuals who were not *Mtb*-sensitised, those who were *Mtb*-sensitised had a 3-fold risk of progressing to incident TB. Because this risk is highest in recently infected (first six months) individuals, a simple and rapid-test which distinguishes recent from remote infection is needed for targeted preventive therapy.

OA08-172-19 Predictive performance of the ESAT6-CFP10 skin test for incident TB: A prospective cohort study

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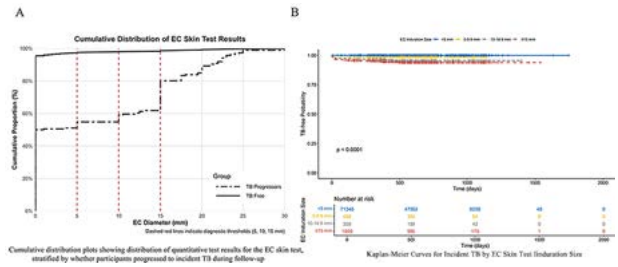
Background: Recent international guidelines endorse Mycobacterium tuberculosis antigen-based skin tests, such as the ESAT6-CFP10 (EC) skin test, as alternatives to the tuberculin skin test (TST) and QuantiFERON-TB Gold In-Tube (QFT-GIT) assay. However, the EC skin test's predictive capacity for incident active tuberculosis (TB) remains unclear. We conducted a prospective cohort study to evaluate its performance in predicting TB disease.

Design/Methods: This study involved 73,761 students and teachers during a school TB outbreak. All participants underwent the EC skin test, with a repeat test offered 2-3 months later for initial negatives per national guidelines (not mandatory).
We assessed predictive performance by estimating hazard ratios (HRs) for TB incidence, comparing positive versus negative results across EC skin test thresholds. Incidence rates, rate ratios, sensitivities, specificities, and predictive values were calculated, stratified by induration sizes (<5 mm, 5–9.9 mm, 10–14.9 mm, ≥15 mm)
Results: Of 73,761 participants, 2,415 (3.3%) had latent TB infection (LTBI) at initial screening. Among 65,735 initially negative individuals, 659 (1.0%) tested positive in the second screening. Over 4 months to 4 years, 209 developed active TB (incidence: 166.08/100,000 person-years). Larger induration sizes correlated with higher TB risk (P<0.0001), per Kaplan-Meier curves and risk tables. Positive predictive values rose modestly with thresholds (initial: 4.7% at ≥5 mm, 5.8% at ≥15 mm; second: 5.2% at ≥5 mm, 7.3% at ≥15 mm).
Sensitivity decreased with higher thresholds (initial: 54.5% at ≥5 mm, 45.0% at ≥15 mm; second: 37.0% at ≥5 mm, 34.8% at ≥15 mm), while specificity improved (initial: 96.9% at ≥5 mm, 97.9% at ≥15 mm; second: 99.0% at ≥5 mm, 99.4% at ≥15 mm).



Cumulative distribution plots showing distribution of quantitative test results for the EC skin test, stratified by whether participants progressed to incident TB during follow-up

Kaplan-Meier Curves for Incident TB by EC Skin Test Induration Size

Conclusions: Higher EC skin test thresholds enhance positive predictive value but reduce sensitivity, underscoring the need for improved biomarkers or risk prediction models to refine TB prediction accuracy.

OA08-173-19 Differences in conversion and reversion rates of interferon gamma release assay in the elderly under different tuberculosis epidemic settings: A prospective quantitative study

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Background: The burden of tuberculosis in the elderly is increasing. Comprehending the burden of latent tuberculosis infection and its variations in the elderly is conducive to developing more effective measures to end tuberculosis.
Design/Methods: From 2021 to 2024, a multi-center prospective observational study based on a cohort design was conducted in Zhejiang Province, China. At the end of one year following the baseline survey, a follow-up survey was implemented to monitor the alterations in the latent tuberculosis infection status of participants based on Interferon gamma Release Assay.
Results: A total of 3208 eligible older adults completed the **baseline(BS)**and **follow-up(FS)** surveys. The positive rate of latent tuberculosis infection at the BS and FS in the **high endemic setting(HES)** was both higher than that in the **low endemic setting(LES)**.
The Sankey diagram indicated that participants with a TBAg-Nil IFN-γ value ranging from 0.2 IU/mL to 0.7 IU/mL at baseline were more likely to undergo conversion and reversion at the follow-up.
The traditional-conversion rate and strict-conversion rate were 11.1% and 3.0% in the HES, which were higher than 5.6% and 1.5% in the LES. The strict reversion rate in the HES was 14%, which was lower than that in the LES (26%).
Compared with participants in the LES, participant in the HES had a higher risk of traditional-conversion (ARR: 2.32, 95%CI: 1.69-3.21) and strict-conversion (ARR: 2.20, 95%CI: 1.16-4.19), and a lower risk of strict-reversion (ARR: 0.5, 95%CI: 0.29-0.87).
Conclusions: The burden of latent tuberculosis infection and the risk of IGRA conversion among the elderly in high-endemic settings were higher than those in low-endemic settings. Hence, it is of great significance and urgency to enhance the active and early detection, standardized treatment of tuberculosis in the high-endemic setting.

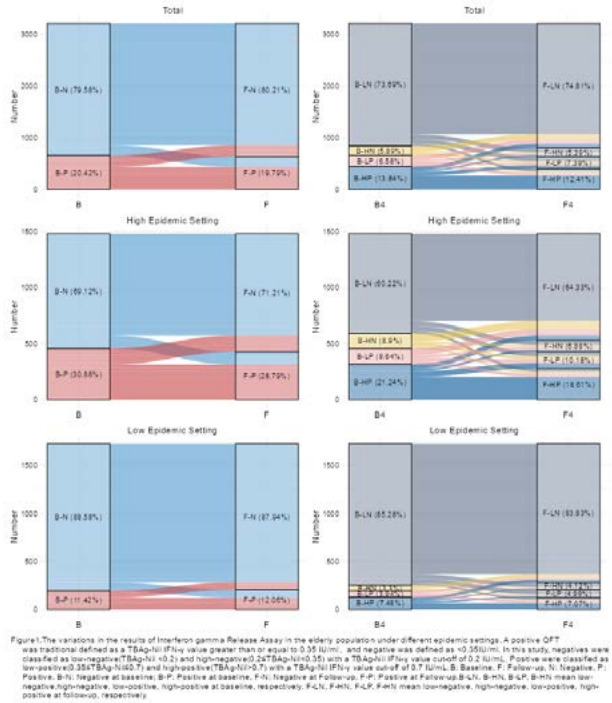

Figure1.The variations in the results of Interferon gamma Release Assay in the elderly population under different epidemic settings. A positive QFT was traditional defined as a TBAg-Nil IFN-γ value greater than or equal to 0.35 IU/mL, and negative was defined as <0.35IU/mL. In this study, negatives were classified as low-negative(TBAg-Nil <0.2) and high-negative(0.2≤TBAg-Nil<0.35) with a TBAg-Nil IFN-γ value cutoff of 0.2 IU/mL. Positive were classified as low-positive(0.35≤TBAg-Nil≤0.7) and high-positive(TBAg-Nil>0.7) with a TBAg-Nil IFN-γ value cut-off of 0.7 IU/mL. B: Baseline; F: Follow-up; N: Negative; P: Positive. B-N: Negative at baseline; B-P: Positive at baseline; F-N: Negative at Follow-up; F-P: Positive at Follow-up.B-LN, B-HN, B-LP, B-HP mean low-negative,high-negative, low-positive, high-positive at baseline, respectively. F-LN, F-HN, F-LP, F-HP mean low-negative, high-negative, low-positive, high-positive at follow-up, respectively.

OA08-174-19 Effect of community-based vs. clinic-based delivery of TB preventive therapy on TPT completion in South Africa: Outcomes from a randomized controlled trial (ThiPhiSA)

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Background: There is a growing gap between people eligible for TB preventive therapy (TPT) and people receiving TPT in South Africa and globally. Community-based, multi-month TPT dispensing could reduce barriers to accessing TPT and improve completion for people with HIV (PWH) and close contacts of people with TB.
Design/Methods: We conducted a household-randomized, non-blinded trial of community-delivered TPT compared to standard clinic services in rural/peri-urban KwaZulu-Natal, South Africa (ThiPhiSA Study). Adults

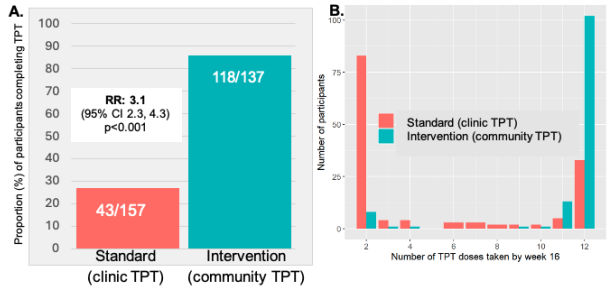
screening negative for TB through a community-wide screening program and eligible for TPT by South African guidelines were randomized 1:1 by household to Intervention: Immediate dispensing of 12 weeks 3HP at the community screening location or Standard: Dispensing 2 weeks 3HP and referral to their local public clinic to collect remaining 3HP per clinic refill schedule. Persons with contraindications for 3HP received 6H.

The primary outcome was TPT completion (defined for 3HP as taking 11 doses by 16 weeks) assessed by pill count and self-report. We used intent-to-treat analysis and estimated relative risks with modified Poisson regression.

Results: Between Feb-2024 to Feb-2025, 301 adults from 268 households were randomized: 211 (70%) female, median age 42 (IQR 35-51). 294 (98%) were PWH and 17 (6%) were household contacts of a person with TB. Eight people received 6H.

Compared to standard clinic care, community TPT delivery increased TPT completion (86% vs. 27%, RR=3.14, 95% CI: 2.32, 4.27). Standard arm participants took a median of 2 doses/weeks of 3HP (IQR 2-11) compared to median 12 doses/weeks (IQR 12-12) in the intervention arm. Five serious adverse events were reported (1 intervention/4 standard arm; none related).

Figure: **A)** Proportion of participants completing TPT by study arm; **B)** Distribution of number of doses of TPT (3HP) completed per participant, by arm, in the ThiPhiSA Study.



Conclusions: Community-based multi-month delivery of 3HP improved TPT completion for TPT-eligible persons in South Africa compared to requiring clinic visits for refills. Person-friendly approaches improving convenience should be adopted to decompress healthcare facilities and improve TPT coverage to meet TB prevention goals.

OA08-175-19 Bridging diagnostic needs in TB elimination: Evidence from a novel TB skin test SIILTIBCY using M. Tuberculosis specific antigens

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Background: Tuberculosis (TB) remains a leading cause of infectious disease mortality worldwide. In the past decade, Europe has not met WHO End TB Strategy milestones, reflecting an urgent need for more accurate, accessible, and population-appropriate diagnostic tools. SIILTIBCY (Cy-Tb) is a novel skin test incorporating two recombinant *Mycobacterium tuberculosis*-specific proteins, rdESAT-6 and rCFP-10, designed to improve the specificity of intradermal TB testing. EMA marketing authorisation was granted in January 2025.

Design/Methods: The diagnostic performance and safety of SIILTIBCY were evaluated in a pooled analysis of seven clinical trials, including comparisons with the tuberculin skin test (PPD) and QuantiFERON-TB Gold (QFT).

Results: In participants with microbiologically confirmed TB, SIILTIBCY demonstrated a sensitivity of 76.8% (95% CI: 72.6–81.1), which was higher than QFT (68.0% [64.0-72.0]) and slightly lower than PPD (85.2% [81.6-88.8]). With 92.8% [90.2-95.5], specificity in TB-negative individuals was similar to PPD (90.7% [87.5-93.9]) and QFT (89.5% [86.3-92.6]).

Interestingly, in a BCG vaccinated sub-group, SIILTIBCY exhibited a higher specificity than PPD when a fixed induration threshold across all populations was used.

In the paediatric population, SIILTIBCY outperformed QFT in specificity (83.7% [76.5-90.8] vs. 72.3% [63.9-81.2]) and matched PPD (83.7% [76.5-90.8] vs. 85.1% [78.2-92.1]).

Across all populations, SIILTIBCY showed high post-test probabilities and a low false-negative rate. Together with the overall safety profile being comparable to PPD, this supports its utility in real-world settings.

Conclusions: Use of specific antigens, an easy application method, and a fixed induration threshold make SIILTIBCY a field-friendly and IGRA-like diagnostic alternative applicable across populations.

OA08-176-19 Clinical safety of levofloxacin for contacts of multidrug-resistant TB: Insights from the VQUIN trial

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Background: The World Health Organization recommends a 6-month course of levofloxacin as TB preventive treatment (TPT) for rifampicin-resistant or multidrug-resistant TB (RR/MDR-TB) contacts.
This study aimed to assess the safety of levofloxacin for RR/MDR-TB contacts.
Design/Methods: We evaluated data from the VQUIN phase 3 trial in Vietnam, which compared 6-month daily levofloxacin with a placebo for treating *M. tuberculosis* infection in predominantly adult household contacts of people with RR/MDR-TB.
Descriptive analyses included event counts and exposure-adjusted-incidence rates (EAIR). EAIR is defined as the number of participants with an event divided by total person-years of exposure. We described the time to adverse events and treatment discontinuation using medians and interquartile ranges. Cox regression was used to describe the risk factors for musculoskeletal events.
Results: A total of 51 (10.4/100-patient-years) and 239 (61.3/100-patient-years) possible and probable drug-related AEs were reported in the placebo and levofloxacin arms, respectively (HR=5.40, 95%CI:3.79-7.70, p<0.001). In the levofloxacin group, 10/239 (4.2%) events were grade 3. The median time-to-AE was 25 days (IQR:7-49), and the median time-to-discontinuation was 90 days (IQR:61-181). Higher-grade AEs were associated with an increased risk of non-adherence and treatment discontinuation. Musculoskeletal events were the most common. Older age (HR=1.06, 95% CI: 1.00–1.13, p=0.036), being a current smoker at baseline (HR=2.51, 95% CI: 1.21–5.20, p=0.013), and consuming alcohol ≥4 times per week at baseline (HR=2.76, 95% CI: 1.24–6.14, p=0.013) were associated with a higher risk of musculoskeletal events.
Conclusions: Levofloxacin was safe for MDR-TB contacts, with very few adverse events greater than or equal to grade 3 reported. Most adverse events were mild to moderate, and musculoskeletal events were the most common. Close follow-up during the first month of treatment is crucial to monitor and manage any adverse events promptly.
Further research evaluating strategies to minimise musculoskeletal symptoms may improve treatment adherence and completion rates.

OA08-177-19 Adherence to weekly 3HP for TB prevention among TB contacts in Uganda: A cross-sectional study

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Background: Adherence to self-administered weekly isoniazid and rifapentine (3HP) for tuberculosis preventive therapy (TPT) remains poorly understood. We objectively assessed 3HP adherence among contacts of persons with TB enrolled in a person-centered household contact investigation program.

Design/Methods: A cross-sectional adherence study was embedded within a larger before-and-after intervention study evaluating a person-centered household contact investigation strategy at 26 health facilities in Uganda.
The strategy involved: standardized educational booklets; task-shifting of contact investigation to community health workers (CHWs); and a community health rider service to transport CHWs, contacts, sputum samples and TPT refills between homes and health facilities. Between October and November 2024, we conducted unannounced home visits within 24 hours of a scheduled dose for contacts receiving 3HP at six facilities.
Consenting participants self-reported adherence and provided urine samples for isoniazid metabolite testing using IsoScreen. Non-adherence was defined as a negative IsoScreen urine test result. Generalized linear models with robust errors were used to identify factors associated with non-adherence.
Results: Overall, 23.1% (64/277) of participants were non-adherent. Non-adherence was notably higher among females (28.7%), people living with HIV (35.0%), alcohol users (29.2%), and non-household contacts (41.7%). In adjusted analyses, females (aPR=2.03, 95% CI: 1.25–3.28, p=0.004), non-household contacts (aPR=3.58, 95% CI: 1.67–7.68, p=0.001), and participants initiated on 3HP without latent TB infection testing (aPR=1.94, 95% CI: 1.25–3.02, p=0.003) were more likely to be non-adherent. Non-adherence progressively increased from 17.1% at weeks 2-3 to 29.3% at weeks 10-12 (p=0.029). Key barriers to adherence included fear of side effects (63.6%) and difficulty remembering to take medication (20.9%), while personal motivation (49.6%) and education on 3HP benefits (39.7%) facilitated adherence.

Characteristic	Categories (n)	PR (95% CI)	p-value	aPR (95% CI)	p-value
Sex	Female	1.81 (1.12-2.93)	0.02	2.03 (1.25-3.28)	0.004
Relationship to index person with TB	Non-household (12)	1.87 (0.92-3.80)	0.08	3.58 (1.67-7.68)	0.001
TB infection test result	Positive (160)	1			
	Negative (43)	1.28 (0.68-2.42)	0.44	1.27 (0.89-2.42)	0.464
	Not tested (74)	1.86 (1.18-2.95)	0.01	1.94 (1.25-3.02)	0.003
Time since start of 3HP	2-3 weeks (99)	1		1	
	4-6 weeks (62)	1.41 (0.76-2.62)	0.28	1.60 (0.84-3.06)	0.156
	7-9 weeks (58)	1.51 (0.81-2.79)	0.19	1.61 (0.83-3.13)	0.167
	10-12 weeks (58)	1.71 (0.95-3.08)	0.08	2.02 (1.07-3.79)	0.029

Conclusions: Despite home-based care, non-adherence to 3HP was substantial. Objective adherence monitoring, targeted gender-sensitive counseling, TB infection testing, and proactive side-effect management are essential components of 3HP delivery to enhance adherence outcomes.

OA08-178-19 Implementing intervention strategy framework to enhance TB preventive treatment in Mansa District of Punjab, India

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Background and challenges to implementation: Several studies have identified key areas for improvement in uptake of Tuberculosis Preventive Treatment (TPT), such as enhancing drug supply consistency, increasing awareness among healthcare providers and strengthening screening and follow-up systems. An assessment conducted in Mansa district during 2024-2025 led to an intervention strategy framework aimed at effectively enhancing TPT implementation and contributing to better health outcomes in community.
Intervention or response: Figure 1 shows cascade of intervention strategy framework. This was rolled out in Mansa district in three phases over 16 weeks from December 2024- March 2025.

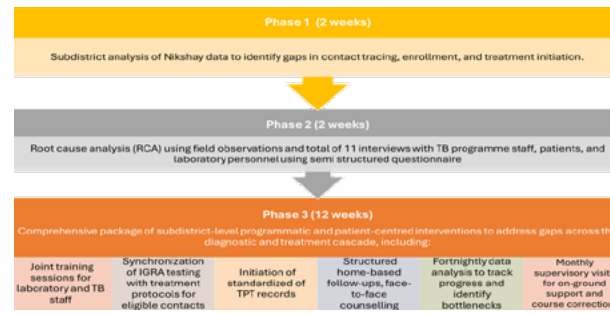

Figure 1: Intervention Strategy Framework for Improving TPT Uptake in Mansa District, India

Post-intervention outcomes, including enrollment, initiation rates, and time to treatment, were compared to Q1 2023 and Q1 2024. Data from Nikshay (India's digital TB surveillance system) was analysed using SPSS version 22, with appropriate statistical tests.
Results/Impact: RCA identified fragmented diagnostic workflows, non-standardized TPT documentation, missed Nikshay entries, and unclear accountability for test-to-treatment linkage as systemic barriers. Targeted interventions in Q1 2025 led to significant improvements

over Q1 2024 and Q1 2023. TPT enrollment increased from 30.8% (n=76) in Q1 2023 and 25.7% (n=66) in Q1 2024 to 65.8% (n=578) in Q1 2025 ($p = 0.02$). TPT initiation rose from 30.8% (2023) and 25.7% (2024) to 65.2% (2025, $p < 0.01$). Among household contacts aged ≥5 years, initiation increased from 24.4% (2023) and 22.7% (2024) to 61.5% in 2025 ($p < 0.01$). For children under 5, initiation improved from 68.6% (2023) and 62.1% (2024) to 91% in 2025 ($p = 0.02$). Median diagnosis-to-treatment time decreased from 7 to 2 days.

Conclusions: The study strongly recommends implementing data-driven interventions to tackle operational and behavioural gaps while enhancing TPT uptake. This includes staff training, home-based follow-ups, timely diagnostic feedback, and regular data reviews. These components collectively address challenges associated with scaling up TPT effectively.

OA09 Finding TB in key vulnerable populations

OA09-179-19 Optimising TB detection through diagnostic intensification: A case study from Baran, Rajasthan

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Background and challenges to implementation: District Baran in Rajasthan faces challenges in Tuberculosis (TB) detection due to limited diagnostic access and a high proportion of socioeconomically vulnerable populations. Although National TB Elimination efforts are in place, early detection remains inadequate.

This study aims to evaluate a targeted diagnostic intervention from December 2024 to March 2025 to enhance TB screening coverage and improve molecular testing efficiency among vulnerable groups.

Intervention or response: A comprehensive intervention was launched, incorporating microplanning and vulnerability mapping to target high-risk areas and populations. Mobile diagnostic units equipped with handheld digital X-ray and NAAT platforms (CBNAAT/Truenat) were deployed to optimize the diagnostic network. Resource mobilization ensured uninterrupted logistics and staff availability. Community-based intensified screening aligned with identified vulnerability clusters was conducted.

Programmatic data from Ni-kshay (India digital TB surveillance system) were analysed to evaluate (i) the proportion of the vulnerable population screened, (ii) microbiological testing patterns, and (iii) daily utilisation of NAAT modules.

Data were extracted from *Ni-kshay*, (India's digital TB surveillance system), and Comparative assessment was done for same cohort previous year using SPSS ver 22.

Results/Impact: Between December 2024 and March 2025, 2,07,884 individuals were screened achieving 228% (triple) coverage. Of the total symptomatic positive, 76% of microbiological tests were conducted using nucleic acid amplification tests (NAAT). Daily NAAT utilization was 69% of the available testing capacity, which is over 200 % more than previous year ($p<0.05$) reflecting significantly improved operational efficiency in molecular diagnostics.

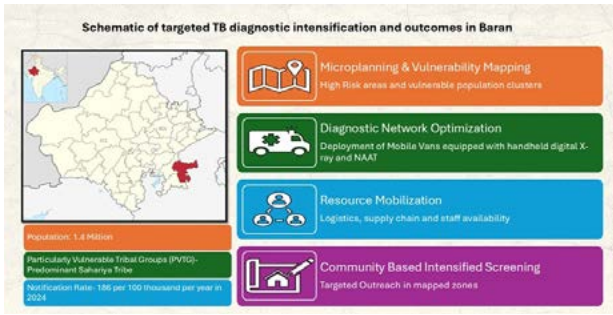

Figure.

Conclusions: The intervention demonstrated significant improvements in TB case-finding metrics in Baran, with exemplary screening coverage and optimal utilization of molecular diagnostics.
These findings highlight the value of tailored, resource-sensitive strategies in aspirational districts to enhance TB detection among underserved populations.

OA09-180-19 TB in an urban slum: Collecting community stories to improve awareness and screening of TB in the Philippines

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Background and challenges to implementation: Effective health promotion is key to successful tuberculosis (TB) care. However, engaging with communities about TB screening, prevention and treatment in a participatory way can be challenging, particularly in densely populated, impoverished areas. TB misconceptions and rumors can hinder successful health messaging.
Intervention or response: Médecins Sans Frontières (MSF) implemented the Story of Change methodology in Tondo, an urban slum in Manila, Philippines. An innovative approach implemented by MSF globally uses storytelling to create and communicate health promotion (HP) messages. Between July-September 2024, community members shared TB stories through a process of participatory listening and exchange. Stories were analyzed and grouped into themes then combined into one fictional story to integrate into community engagement and HP activities.
Results/Impact: Personal stories collected increased the understanding of challenges and experiences faced by communities in relation to TB screening and treatment.
Shared stories included experiences of TB-related stigmatization, discrimination and isolation, fears of screening and receiving positive results, people who struggled to access health-care services or take their TB treatment and people not wanting treatment because of a lack of perceived illness.
Once diagnosed, most patients, despite the initial distress, accepted treatment to prevent TB transmission to their household members and friends, highlighted the importance of support networks, and shared stories of how those who had completed TB treatment had a renewed commitment to a healthier lifestyle.
The final story includes the experiences of several people, focusing on the importance of family support during TB screening, treatment and diagnosis.
Conclusions: The Story of Change methodology enabled understanding of firsthand community members experiences which contributed to the development of participatory, culturally relevant HP and community engagement. Community-driven methods in overcoming barriers to TB prevention and care are important.
Expanded use of storytelling can enhance TB-related communication via contextualised, relatable health messages and improve TB screening uptake and reduce stigmatization.

OA09-181-19 Improving finding TB among vulnerable populations using portable digital X-ray (PDX) machine: Experience from Kano State correctional centres

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Background and challenges to implementation: Tuberculosis remains a global health challenge with Nigeria ranking first in Africa and 6th globally in terms of TB burden. Correctional centres are high-risk environments for TB transmission due to overcrowding, poor ventilation, and limited access to healthcare. Inmates in correctional centres face substantial barriers in accessing TB diagnosis and treatment, often resulting in delayed diagnosis and poor treatment outcomes.
This study explores the implementation of active TB case finding among inmates in Kano correctional centers using CAD4TB (Computer aided detection for Tuberculosis) AI-screening PDX machine designed to facilitate early case detection.
Intervention or response: This study was conducted in Kurmawa and Goron Dutse correctional centers in Kano State, Nigeria, targeting all inmates in the facility. To enhance early TB detection, KNCV Nigeria deployed PDX machine with artificial intelligence software, CAD4TB. The case-finding strategy involved active screening where all consenting inmates underwent WHO 4-symptom

screening and digital chest X-ray. Those with CAD4TB scores above 34 provided sputum samples for TB-LAMP or Truenat testing, while individuals unable to produce sputum or those with negative molecular test results symptoms were further evaluated for clinical diagnosis. Diagnosed TB cases were enrolled on treatment.
Descriptive statistics were used to analyze and present the results of screening conducted between January and December 2023.
Results/Impact: A total of 5,338 (100%) Inmates were screened for TB, 390 (7%) presumptive for TB identified, and all of them were evaluated (100%) using TB Lamp or Truenat machines, 57 (15%) TB cases were diagnosed and 100% of the diagnosed cases were enrolled on TB treatment.

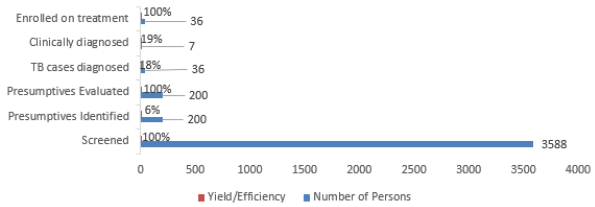

Figure. Graphical representation of the TB screening data for 2023 at the Kurmawa & Goron Dutse correctional centres using the PDX machine.

Conclusions: The comprehensive TB case finding strategy using the PDX machine with CAD4TB AI and treatment programme implemented in Kano correctional centres resulted in improved TB case detection and treatment outcomes among inmates. By leveraging existing social networks and cultural capital, we recommend a similar approach across all vulnerable populations in the country.

OA09-182-19 From evidence to policy: Prioritising TB key and vulnerable populations (KVPs) in Tanzania for strategic investment

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Background and challenges to implementation: Despite significant efforts, Tanzania continues to experience high TB incidence, with an estimated 128,000 new cases and 18,100 deaths annually. Hard-to-reach populations often invisible in surveillance systems bear a disproportionate burden of disease. In 2024, Tanzania's National TB and Leprosy Programme (NTLP), in collaboration with SHDEPHA+ and civil society, conducted a national prioritization of TB Key and Vulnerable Populations (KVPs) to inform a targeted size estimation and mapping strategy and align with the Global Plan to End TB.
Intervention or response: A two-day national roundtable was convened in May 2024, engaging 20+ multisectoral stakeholders including ministries, civil society organizations, and community representatives. Twenty KVP groups were scored across six vulnerability domains: environmental, biological, behavioral, legal, socio-cultural, and economic. Scoring was conducted in small groups using a consensus-based framework adapted from the Stop TB Partnership's Data for Action Guide. Final scores were validated in plenary sessions and used to categorize risk levels.
Results/Impact: Eight KVPs were identified as high-risk, with average vulnerability scores ranging from 57% to 79%. These groups included people who use drugs, urban/rural poor, artisanal miners, fisherfolk, refugees and migrants, prisoners, homeless/nomadic populations, and people living with HIV. Five additional groups including children, elderly, healthcare workers, and those with chronic illnesses were categorized as medium risk. Findings revealed overlaps, stigma, and gaps in service access across these groups. Stakeholders emphasized the need for targeted, data-informed interventions tailored to each group's specific vulnerabilities.

Key and Vulnerable Population	Average Risk Score (%)
People who use drugs (PWUD/PWID)	79%
Urban and rural poor (slums)	78%
Artisanal miners	74%
Homeless and nomadic populations	68%
Migrants, refugees, and IDPs	65%
Fisherfolk	64%
People living with HIV (PLHIV)	63%
Prisoners and detainees	57%

Table 1: TB KVP prioritization

Conclusions: This participatory and evidence-based process resulted in a national KVP prioritization framework that enhances programmatic equity and accountability. It informed policy direction for TB KVP mapping and future interventions. The approach demonstrated that targeting TB in Tanzania must be intersectional responding to social, legal, and environmental determinants and must be grounded in community voice, inter-sectoral action, and data.

OA09-183-19 Invisible populations, visible impact: Reaching nomadic and hard-to-reach populations through community TB interventions in Northern Nigeria

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Background and challenges to implementation: Northern Nigeria harbors a significant burden of undiagnosed tuberculosis (TB), particularly among nomadic, pastoralist, and geographically isolated communities. These populations often remain invisible to routine TB programs due to mobility, stigma, and weak health infrastructure. This abstract presents the outcomes of a targeted community-led TB active case finding intervention implemented under the Global Fund-supported N-THRIP project.
Intervention or response: Community-based organizations (CBOs) were engaged in January 2024 to implement home-to-home and outreach TB screening campaigns in hard-to-reach communities across 64 Local Government Areas in Borno, Adamawa and Taraba States, areas with a significant nomadic population. Special outreach models included use of mobile diagnostic vans, evening and weekend screenings, and collaboration with traditional leaders and nomadic gatekeepers. TB screening, testing, and treatment initiation data were extracted and disaggregated by population type and location.
Results/Impact: From January to December 2024, TB screening across targeted nomadic communities in these three states led to 8,695 confirmed diagnoses from 86,647 presumptive cases identified from the 277,048 individuals screened, yielding a detection rate of 3.1% and a **Number Needed to Screen** (NNS) of 32, slightly below the national average of 42. Among nomadic populations, culturally tailored approaches including Fulani mobilizers and local-language messaging helped foster trust and participation. Despite logistical challenges such as poor road access and weak network coverage, adaptive planning and collaboration with local actors ensured smooth implementation. Impressively, 99.9% of all diagnosed cases were promptly linked to care and started treatment at nearby public facilities.
Conclusions: This intervention demonstrates that with context-specific strategies, community systems can effectively identify TB cases among populations historically excluded from formal health systems. Investing in locally adapted models, leveraging traditional structures, and optimizing last-mile logistics can transform TB case finding in underserved populations and accelerate progress toward TB elimination in fragile settings.

OA09-184-19 Integrating TB screening and treatment into social protection programmes to enhance early detection and access to care

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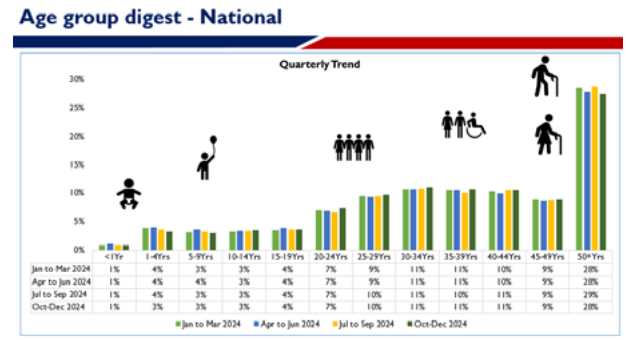
Background and challenges to implementation: Globally, Uganda ranks among the 30 high-burden TB-HIV countries, with 88,869 reported TB patients in 2024, compared to an estimated annual burden of 940,000. Among older individuals aged over 50, tuberculosis presents a significant challenge, accounting for 28% of national notifications in 2024, despite those aged over 60 constituting only 9.2% of the total population. Individuals over 60 years are at a heightened risk of developing TB due to weakened immune systems, comorbidities with non-communicable diseases, malnutrition, and limited access to healthcare.



Intervention or response: In June 2024, National TB and Leprosy Programme in collaboration with USAID Local Partner Health Services, Acholi, and PACT Karamoja, strategically partnered with Expanded Social Protection Programme of the Ministry of Gender, Labour, and Social Development to integrate Tuberculosis care services into the Social Assistance Grant for the Elderly (SAGE) programme. SAGE staff were oriented on tuberculosis to enhance their awareness of the disease and to integrate

tuberculosis care services into SAGE operations. The trained staff members became change agents and mobilised beneficiaries for tuberculosis screening during the SAGE pay points.
Results/Impact: 980 SAGE beneficiaries from 15 payout points in the Acholi and Karamoja districts were sensitised and screened for tuberculosis. Among these 980 beneficiaries, 530 (54%) were identified as presumptive and provided a sputum sample for testing, under WHO-recommended molecular testing.11 individuals were found to be TB-positive, including one (1) patient with multidrug-resistant TB. Tuberculosis screening and testing at the SAGE pay points yielded a positivity rate of 2.1%, significantly higher than the national average of 0.2%. All patients were referred for TB treatment at the nearest health facility, ensuring prompt access to appropriate medical interventions.
Conclusions: Integrating tuberculosis screening into social protection programmes enhances early detection and access to care. The significant positivity rate emphasises the need for expanded, targeted interventions to improve tuberculosis control among elderly populations.

OA09-185-19 Associations between community venue-time and incident TB infection among children and youth in rural Uganda

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Background: Estimates suggest that most TB infections are acquired outside the home. Yet, data on where children/youth acquire TB are sparse and needed to guide age-specific case-finding. In SONET, a longitudinal cohort of children/youth 1-24 years in rural Southwestern Uganda, we sought to evaluate whether (1) incident TB infection was associated with time in community-based venues and (2) certain venue-types were associated with incident TB.
Design/Methods: The SONET incidence cohort included participants who had a negative QuantiFERON-Plus (QFT) at baseline and a repeat QFT one-year later. Incident TB infection (case) was defined as QFT conversion from negative to positive. Cases and a random sample of controls completed a social-spatial network (SN) questionnaire, asking about time spent in community-based venues. For children <12 years, we surveyed the primary caregiver. By case-control status, we compared (1) median total monthly-hours spent in community-based venues, restricting the caregiver network to only when they brought the child with them, with a Wilcoxon rank-sum test; and (2) number of named venues by case-control status with a t-test.
Results: From June 2023-June 2024, 3,290/4,961 (66.3%) baseline QFT-negative participants completed a follow-up QFT. Among them, 66/3,290 (2.0%) had incident TB infection, 60/66 (90.9%) completed the SN questionnaire plus 579 controls. Overall, there was no difference in median monthly-hours spent in community-based venues comparing cases and controls, but a significant difference was seen within males ages 12-24 (median 78.1 hours/month vs. 43.3 hours/month, respectively, p=0.05). Cases/their caregivers named significantly more video halls than controls (p=0.03) and more bars (p=0.06), particularly when restricted to males (p=0.01).

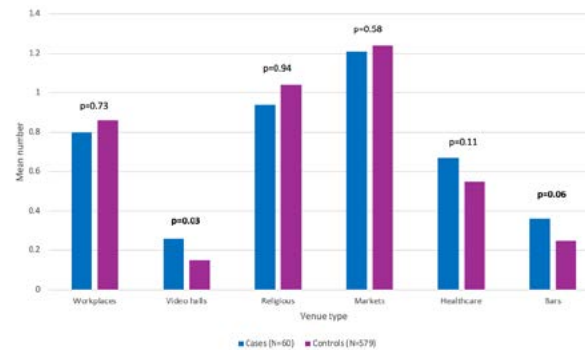

Figure 1. Mean number of venue-type by case-control status (min 0; max 3).

Conclusions: In this cohort, venue-types emerged as potentially high-yield for active case-finding, particularly for males, for whom community-based exposures may play a larger role. These data can help inform novel community-based screening programs and are among the first to highlight video halls as a key venue for youth.

OA09-186-19 Paradigm of ending TB in special populations in Kano State

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Background and challenges to implementation: Ending TB among special populations requires a multifaceted approach, including targeted screening, improved access to diagnosis and treatment. According to WHO, correctional centres are considered reservoirs facilitating TB and multidrug-resistant TB transmission within their walls and to the community at large. Overcrowding significantly hinder TB prevention and care among these special group of people that are vulnerable to TB transmission, exacerbated by other unfavourable living condi-

tions within the settings, access to care is also hindered as they are not stable with inmates having variable durations of stay. We present results of TB active case finding services among inmates in correctional centers in kano state, Nigeria.

Intervention or response: A retrospective observational study was conducted in 2022 under which KNCV Nigeria implemented the Portable Digital X-ray (PDX) intervention. The PDX initiative was rolled out across seven states, with Kano State deploying 2 machines.

This intervention aimed to facilitate active TB case finding among inmates, Goroundutse and Kurmawa are the 2 federal correctional centres in Kano having over a thousand inmates who are transient stays, and its implications for ending TB through chest X-ray screening, GeneXpert testing, and prompt linkage to care

Results/Impact: A total of 2,608 individuals were screened using PDX. Of these, 211 were identified as presumptive TB cases and evaluated accordingly. TB was confirmed in 11 individuals using GeneXpert, while 36 were diagnosed via chest X-ray findings. Translating to a total of 47 inmates were enrolled.

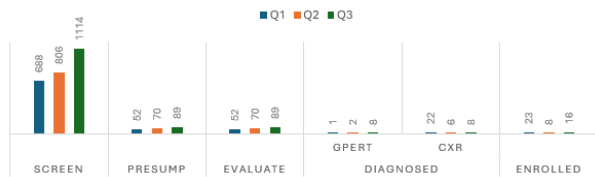

Figure. TB cascade for PDX screening in Kurmawa & Goron Dutse correctional centres Q1-Q3 2022.

Conclusions: The PDX intervention significantly improved TB case detection in correctional centres, enabling early diagnosis and treatment in a population that is typically underserved showcasing the potential of innovative tools and targeted interventions to close existing TB care gaps in special populations.

Sustaining and scaling up such programs is essential to disrupt TB transmission in closed settings and reduce public health risk both within and beyond prison walls.

OA09-187-19 Addressing the gap: TB preventive treatment implementation in people with silicosis in Brazil

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Background: People with silicosis have a 2.8 to 39 times higher risk of developing tuberculosis compared to the general population, making preventive care essential for this vulnerable group.

Design/Methods: To analyze the implementation of tuberculosis preventive treatment (TPT) among people with silicosis in Brazil, identifying gaps and regional disparities to strengthen integrated public health interventions. Methodology: We analyzed nationwide data through the Brazilian Ministry of Health Notifiable Diseases Information System (Sinan, Pneumoconiosis Silicosis 2006-2024) and the Latent Tuberculosis Infection System (IL-TB (2018-2024)).

Statistical analyses included standardized morbidity ratios (SMR), chi-square tests, odds ratios (OR), quantification of the implementation gap, multiple logistic regression, and population attributable fraction (PAF) for TPT among people with silicosis across different regions and municipalities.

Results: Among 2,784 people reported with silicosis, only 39 people (1.4%) with both TB and silicosis were documented, and additionally just 179 people with silicosis (6.4%) received TPT. The observed TB-silicosis representation corresponds to an SMR of 0.50 (95%CI: 0.36-0.69), indicating potential underdiagnosis. Regional disparities were highly significant ($\chi^2 = 78.6$, $p<0.0001$), with municipalities in the South region being 6.20 times more likely (95% CI:3.57-10.79) to implement TPT than the Southeast, despite the latter having higher silicosis prevalence. Municipalities with occupational health services had significantly higher implementation rates (OR = 3.76, 95% CI: 2.83-4.98).

Conclusions: The significant disparity between the burden of silicosis and TPT implementation represents a missed opportunity for disease prevention. Our findings support the need for integrated care pathways between occupational health services and infectious disease services, with targeted interventions in municipalities with higher silicosis prevalence. Policy recommendations include shared care protocols, mandatory ILTB screening for all people with silicosis, regional training programs, and strengthening surveillance systems to reduce the deadly combination of tuberculosis and silicosis among Brazilian workers exposed to silica dust.

OA09-188-19 Leveraging on nutritional clinics to improve childhood TB detection in public health facilities: Kano State experience

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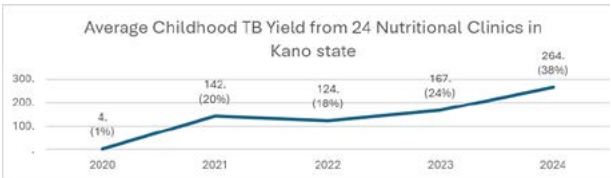
Background and challenges to implementation: Nigeria is one of the countries with the highest TB burden globally, and childhood TB is a significant part of this. Studies indicate that pulmonary tuberculosis is the most common form in children, and clinical diagnosis based on symptoms, contact history, and radiological findings is crucial for younger children that are unable to produce sputum. And the underlying factors for TB in children includes poor health infrastructure, poverty, malnutrition and lack of awareness.
Intervention or response: KNCV Nigeria through the USAID Funded TB LON 1&2 Project has trained health care workers on screening and identification of a presumptive TB case, referral for evaluation and linkage to TB treatment. Each facility has a TB screener at the Nutritional Clinic who conduct health talk on signs and symptoms of TB in children. While the physicians armed with the prerequisite knowledge on clinical features of TB in children, identify and referred presumptive for free chest X-ray provided by KNCV Nigeria and the TB cases diagnosed with any of the diagnostic tools available were enrolment on TB treatment immediately.
Results/Impact: Kano state has a total of 60 Children Nutritional Clinics spread across 44 LGAs of the state and KNCV is conducting TB Screening in 24(40%) of this facilities in 14 LGAs and from January 2020 – December 2024, a total of 364,075 attendees were recorded, and 295,769(81%) children were screened for signs and symptoms of TB, while 20,643(7%) identified as presumptive for TB, 16,680(81%) evaluated for TB using Genexpert machine, and a total of 703(4%) were diagnosed to be positive for TB and 673(96%) of them were enrolled on TB treatment.



Conclusions: The achieved result from the intervention clearly shows that a scale up of TB screening in all the nutritional clinic across the state will increase childhood TB case finding in Kano state.

OA10 Just the two of us: The continuum of maternal and early childhood TB

OA10-189-19 Systematic review of TB screening and diagnostic tools for pregnant and postpartum women

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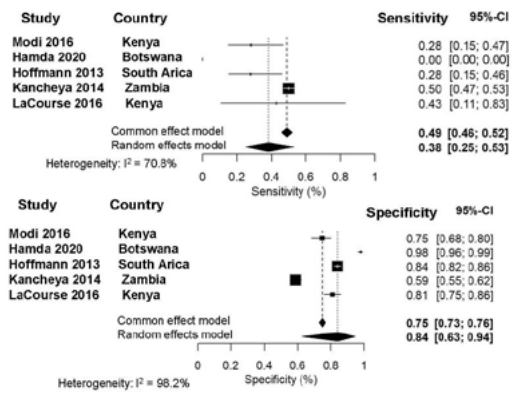
Background: Over 200,000 pregnant women are estimated to develop tuberculosis (TB) each year. However, the performance of screening and diagnostic tools for TB infection (TBI) and TB disease (TBD) in this population is not well understood. We conducted a systematic review to synthesize evidence on the performance of TBI and TBD screening and diagnostic tests in pregnant and postpartum women.
Design/Methods: We searched PubMed, Web of Science, and Embase from January 2000 to September 2024 for articles reporting data on TBI and TBD screening and/or diagnostic tests among pregnant, postpartum, and/or lactating women. Two reviewers conducted title/abstract and full-text reviews.
We abstracted data to calculate:
1. number needed to screen (NNS), defined as the inverse of the proportion with TB detected;
2. kappa statistic for test agreement, and;
3. diagnostic accuracy (sensitivity and specificity).
Analyses were stratified by HIV status and peripartum stage.
Results: Of 6,168 articles screened, 53 were included. For TBI, interferon-gamma release assay (IGRA) yield was generally higher than TB skin test (TST) yield [weighted mean NNS range: 3-7 vs. 5-9; n=29 studies]. In 5 longitudinal studies, IGRA yield remained higher than TST yield across peripartum stages, regardless of HIV status. Pooled kappa for TST/IGRA ranged from poor to moderate (0.07 to 0.60; n=13 studies). Among pregnant women with HIV, pooled sensitivity of symptom-based screening was 38% (95% CI: 25-53) and pooled specificity was 84% (95% CI: 63-94) [Figure; n=5 studies]. Xpert MTB/RIF for TB screening showed higher accuracy (pooled sensitivity: 63% [95% CI: 25-90]; pooled specificity: 99% [95% CI: 83-100]; n=2 studies).

Figure. Sensitivity (top panel) and specificity (bottom panel) of symptom-based screening among pregnant women living with HIV, relative to microbiological reference standard.



Conclusions: For TBI screening among pregnant and postpartum women with and without HIV, IGRA is likely to detect more TBI than TST. Performance of symptom-based screening and Xpert for TBD was suboptimal. Data was limited for pregnant women without HIV and for other TBD screening and diagnostic tools.

OA10-190-19 Maternal TB infection risk in pregnant women living with HIV

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Background: Women are at greatest risk of Tuberculosis (TB) during pregnancy and immediately postpartum. The World Health Organization recommends TB preventive therapy (TPT) for pregnant people living with HIV (PLHIV) in high-burden settings. We assessed prevalence and risk factors of TB infection (TBI) among participants enrolled in the DOLPHIN Moms trial.
Design/Methods: Dolphin Moms is a Phase II open-label multi-centre randomized controlled trial across three sites in South Africa. Pregnant PLHIV(≥18 years) with, singleton pregnancies at 20–34 weeks gestation, virally suppressed on at least 4 weeks of DTG-based antiretroviral therapy were randomised to receive one month of daily isoniazid and rifapentine (1HP) or three months of once-weekly isoniazid and rifapentine (3HP). TBI testing was performed with (QuantiFERON-TB Gold plus). Logistic regression was used to identify baseline factors associated with maternal TBI. Variables with a p-value<0.20 in the univariate analyses were included in a multivariable model and adjusted for age.
Results: 215 pregnant PLHIV (n_{1HP}=89 ; n_{3HP}=126) were tested for TBI. Baseline TBI prevalence was 42.33% (91/215, 5 indeterminate, 1 missing) and similar in both 40.45%(1HP) and 43.65% (3HP) arms. In univariable analyses, earlier gestational age, higher median CD4, previous alcohol, and tobacco use was associated with TBI. However, in multivariable analyses only higher CD4 and tobacco use remain relevant. Refer to Table 1.

Characteristic		IGRA result			Univariable		Multivariable	
		Positive, N=91 n (%)	Negative, N=118 n (%)	Total	OR (95% CI)	p-value	OR (95% CI)	p-value
Age	Median (IQR)	33 (28-36)	31 (28-35)	32 (28-36)	1.018 (0.968-1.071)	0.490	1.035 (0.978-1.095)	0.237
Gestational age - categories	20 - 26 weeks	48 (52.7)	43 (36.4)	91 (43.5)	ref 0.521		ref	
	26 – 34 weeks	43 (47.3)	74 (62.7)	117 (56.0)	(0.298-0.909)	0.022	0.598 (0.325-1.101)	0.099
CD4	Median (IQR)	755 (639-915)	647 (454-806)	696 (522-845)	1.002 (1.001-1.003)	<0.001	1.002 (1.001-1.004)	<0.001
Reported tobacco use	Never	70 (76.9)	104 (88.1)	174 (83.3)	ref 2.229		ref 2.385	
	Yes	21 (23.1)	14 (11.9)	35 (16.7)	(1.062-4.676)	0.034	(1.027-5.54)	0.043
Reported alcohol use	Never	59 (64.8)	59 (64.8)	152 (72.7)	ref 2.018		ref 1.524	
	Yes	32 (35.2)	32 (35.2)	57 (27.3)	(1.089-3.738)	0.026	(0.763-3.047)	0.233

Table 1: Baseline factors for maternal TBI risk evaluated

Conclusions: We found a high prevalence of TBI among pregnant women, with multiple risk factors for TBI, underscoring the need for data on shorter TPT regimens in this population. Alcohol and tobacco use may be associated with maternal TBI. Counselling of Pregnant PLHIV on tobacco use and alcohol consumption is needed.

OA10-191-19 Cytokine profiles in pregnant women from India and South Africa stratified by presence of TB or latent TB across pregnancy stages

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Background: Tuberculosis (TB) adversely affects pregnant women. Previous studies showed that pregnancy-related immune changes decrease TB-specific interferon-gamma (IFN-γ) responses. We analysed other cytokines across pregnancy stages to evaluate their ability to discriminate TB groups.
Design/Methods: Pregnant women were enrolled in India and South Africa (SA) and stratified by IFN-γ Release Assay (IGRA), HIV and TB disease status. Eight cytokines (IFN-α, IFN-β, IFN-γ, IL10, IL4, IL6, IP10, TNF-α) measured from plasma using Luminex at antepartum, delivery, and postpartum. Differences in inflammatory response and cytokine discriminatory ability across TB groups and pregnancy stages were analysed using a random effects univariate model that reflects longitudinal changes.
Results: Of 103 enrolled participants who contributed 439 samples (India 174 and SA 265), 27 had active TB disease; 47 were IGRA positive, and 29 IGRA negative with no TB. Median age was 28 (IQR 24-33) years, gestational age 19.3 (IQR 15.6-22.6) weeks, 42/103 (41%) living with HIV, with median CD4 573 cells/mm^3 (IQR,426-857) and 83% with viral load <200 copies/ml. Pairwise comparisons showed that all cytokines except IFN-β had significant differences between active versus latent TB ($p \leq 0.001$) and active versus no TB ($p<0.05$). With any TB (active or latent) vs no TB, IFN-α, IL10, IL4, IL6, IP10, and TNF-α were significantly elevated, while IFN-γ was significantly low. Random effects model for different cytokines across pregnancy and postpartum showed that IL10 (p=0.03) and IL6 (p=0.02) remained significantly higher in women with any TB versus no TB at delivery. Postpartum, IFN-β (p=0.004) was significantly higher in any TB versus no TB. Thus, distinguishing latent from active TB and any TB from no TB.

Table 1: Comparison of cytokines between TB groups

Cytokines	Active TB vs No TB		Latent TB vs No TB		Active TB vs Latent TB	
	Slope difference (95% CI)	p value	Slope difference (95% CI)	p value	Slope difference (95% CI)	p value
IFN alpha	0.38 (0.13, 0.63)	**0.003**	0.01 (-0.20, 0.22)	>0.9	0.37 (0.15, 0.60)	**0.001**
IFN beta	-0.94 (-3.1, 1.2)	0.4	-0.61 (-2.5, 1.3)	0.5	-0.33 (-2.3, 1.6)	0.7
IFN gamma	-2.7 (-4.7, -0.70)	**0.01**	1.2 (-0.59, 3.0)	0.2	-3.9 (-5.8, -2.1)	**<0.001**
IL10	0.51 (0.16, 0.86)	**0.004**	-0.09 (-0.39, 0.22)	0.6	0.60 (0.28, 0.91)	**<0.001**
IL4	11 (6.2, 15)	**<0.001**	0.12 (-3.8, 4.1)	>0.9	11 (6.5, 15)	**<0.001**
IL6	7.2 (2.0, 12)	**0.01**	-0.51 (-5.0, 4.0)	0.8	7.7 (3.0, 12)	**0.001**
IP10	15 (9.0, 22)	**<0.001**	0.41 (-5.2, 6.1)	0.9	15 (9.3, 21)	**<0.001**
TNF alpha	1.2 (0.25, 2.0)	**0.01**	-0.54 (-1.3, 0.25)	0.2	1.7 (0.88, 2.5)	**<0.001**

Table 1 shows the pairwise cytokine comparison between Active TB versus No TB, Latent TB versus No TB, and Active versus Latent TB using a Random effects univariate model that reflects longitudinal changes at all pregnancy stages ie, antepartum, delivery, and postpartum. The slope difference with 95% confidence intervals and p value are considered significant when <0.05.

Conclusions: Our study identified significant variations in cytokine levels across different TB groups and pregnancy stages, underscoring their potential as diagnostic markers for TB disease and infection in this high-risk population. However, further validation is needed in this context.

OA10-192-19 An assessment of guideline implementation for TB screening among pregnant women living with HIV using linked population data in the Western Cape, South Africa

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Background: Pregnancy increases the risk of tuberculosis disease (TB), a leading cause of non-obstetric maternal death among pregnant women living with HIV (pWLHIV). In 2019, South African guidelines recommended that all pWLHIV receive GeneXpert-MTB/RIF (GXP) sputum testing. Using routine electronic public service health data consolidated in a health information ex-

change, we aimed to assess the implementation of GXP screening among pWLHIV in the Western Cape province (WC), South Africa.

Design/Methods: The cohort included all pWLHIV with a first antenatal visit during 2018–2023 and a recorded birth outcome.

Results: The cohort included 513,556 women and 583,815 pregnancies, with an HIV prevalence of 17.5%. Of all pWLHIV, 95.7% had evidence of antiretroviral therapy (ART), of whom 22.8%% initiated or restarted ART during pregnancy. In total, 17,621 (17.6%) pWLHIV had evidence of previous TB. TB was diagnosed in 1.1%–1.9% of pregnancies per year. GXP testing during pregnancy increased annually from 6.3% in 2018 to 37.0% in 2023 with the largest changes occurring in 2019 (+7.5%) and 2020 (+12.4%) after the introduction of the 2019 guidelines. A corresponding annual decrease occurred in the proportion of positive GXP results, from 9.1% in 2018 to 2.5% 2023. In a subset of pWLHIV for whom data were available (8,732), TB symptom screening and GXP testing were performed among 84.6% and 10.8% of women, respectively, over the period.

Conclusions: TB is common before and during pregnancy in WLHIV in the WC. GXP testing among pWLHIV in the WC increased annually with implementation of the screening guidelines in 2019. The corresponding decline in the rate of GXP positivity supports the conclusion that these are screening, rather than diagnostic, tests. However, guideline implementation remains poor. Given the adverse maternal, pregnancy and neonatal outcomes of maternal TB, effort is required to improve screening uptake.

OA10-193-19 Pregnant women experience delay in initiating anti-TB treatment

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Background: Tuberculosis (TB) incidence peaks in women during their reproductive years and is a leading cause of maternal mortality. Pregnant women with TB have poor TB treatment outcomes, including failure to initiate TB treatment. Poor TB treatment outcomes are a predictor of adverse pregnancy outcomes. We determined the time to TB treatment initiation in pregnant women diagnosed in a routine programmatic setting.

Design/Methods: Using a Provincial Health Data Center, we identified women, 15-45 years, with laboratory-confirmed and clinically diagnosed TB, October 2018-December 2020, in 2 health sub-districts in Cape Town, South Africa. We compared women with TB by pregnancy status, used Kaplan-Meier curves to determine the time from TB diagnosis to initiation of antituberculosis treatment and Cox regression for determinates of treatment initiation.

Results: Of 5459 women, 292 (5.3%) were documented as being pregnant. Pregnant women were younger (median age 28.6 years; IQR:23.7–33.7) than non-pregnant women, (31 years; IQR:25.2–36.5). HIV prevalence was similar by pregnancy status (249/292; 60.6% in pregnant vs 4439/5167; 62% in non-pregnant women). The proportion initiated on TB treatment was similar (249/292; 85.3% in pregnant and 4439/5167; 85.9% in non-pregnant women), but the time to linkage was longer in pregnant women (Figure 1; Log-Rank test p=0.0046). In univariate Cox regression, being pregnant was associated with a lower likelihood of initiating treatment (HR=0.83; 95%CI: 0.73-0.95). In the multivariable model, being HIV-negative (aHR1.08 95%CI:1.02-1.16), being diagnosed at a primary healthcare facility compared to a hospital (aHR 3.83 95%CI:3.52-4.17), and having a clinical TB vs. laboratory-confirmed diagnosis (aHR 4.97 95%CI:4.57-5.39) were associated with greater likelihood of initiating TB treatment.

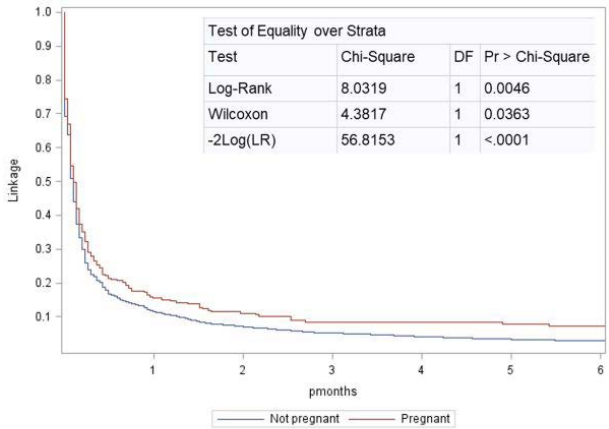

Figure 1: Time to linkage to care stratified by pregnancy status over 6 months

Conclusions: Pregnant South African women experienced more delay in initiating TB treatment and had high HIV prevalence. Linkages to TB treatment initiation should be strengthened to ensure timely treatment initiation in pregnant women, especially for women diagnosed in hospital.

OA10-194-19 Improving access to BDLLC regimens for pregnant women with rifampicin-resistant TB in South Africa

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Background: People initiating rifampicin-resistant tuberculosis (RR-TB) treatment through the national treatment programme in South Africa are registered on the national Electronic Drug-Resistant Tuberculosis Register (EDR.web) database; historically, pregnancy test results were rarely recorded.
Here, we present an analysis of routine data from women treated for RR-TB since 2023, when pregnancy status was first introduced as a required data variable in EDR.web and when national treatment guidelines were updated to recommend a 6-month regimen containing bedaquiline, delamanid, linezolid, and levofloxacin and/or clofazimine (BDLLC) for pregnant women with RR-TB.
Design/Methods: Patient characteristics, RR-TB regimen composition and treatment outcomes obtained from patient records were routinely entered on EDR.web. Individual level patient data were filtered by pregnancy status and assimilated in Excel for descriptive analyses of characteristics and treatment outcomes of pregnant women through 2023 and 2024.
Results: Between 04 Jan 2023 and 11 March 2025, 6052 women were registered on EDR.web and 182 (3%) were pregnant (74% with HIV). Maternal characteristics and treatment regimens are presented in Table 1.

Characteristic	With HIV (n = 135)	Without HIV (n = 47, including 1 with unknown HIV status	Total (n = 182)
Age in years, median (IQR)	32 (28 – 34.5)	29 (23 - 32)	31 (27 – 34)
Previous TB treatment, number (%)	17 (12.6)	4 (8.5)	21 (11.6)
Baseline weight in kg, median (IQR)	62.3 (50.3 – 74.2)	58.8 (51.4 – 70)	62 (50.8 – 73)
RR/MDR-TB (including rifampicin-mono-resistant), number (%)	126 (93.3)	44 (93.6)	170 (93.4)
Pre-XDR or XDR-TB, number (%)	7 (5.2)	3 (6.4)	10 (5.5)
Initiated 6-month BDLL regimen, number (%)	62 (45.9)	18 (38.3)	80 (44)
Initiated other shorter regimen (9-11 months), number (%)	46 (34.1)	20 (42.6)	66 (36.3)
Individualised regimen, number (%)	27 (20)	9 (19.1)	36 (19.8)
On ART at start of RR-TB treatment (of those with HIV), number (%)	133 (98.5)	-	-

Table 1.

Since the updated treatment guidelines were implemented in September 2023, 80 (72%) of 111 pregnant women initiating RR-TB treatment started a 6-month BDLLC regimen. Of 149 pregnant women who initiated any RR-TB treatment before June 2024, 129 (87%) women had outcome data available at the time of analysis (March 2025). Of these, 100 (78%) were successfully treated, 4 (3%) died, 23 (18%) were transferred or lost-to-follow-up and 2 (1%) experienced treatment failure.
Conclusions: Inclusion of pregnancy status in the national RR-TB treatment register facilitated analysis of routine data from pregnant women and demonstrated improved access to BDLLC regimens following updated guideline implementation. Initiation of BDLLC regimens for pregnant women is expected to increase and treatment outcomes can now be routinely monitored as updated guidelines are implemented and when new regimens are recommended in future.

OA10-195-19 Clofazimine exposure in the breastmilk of women treated for rifampicin-resistant TB

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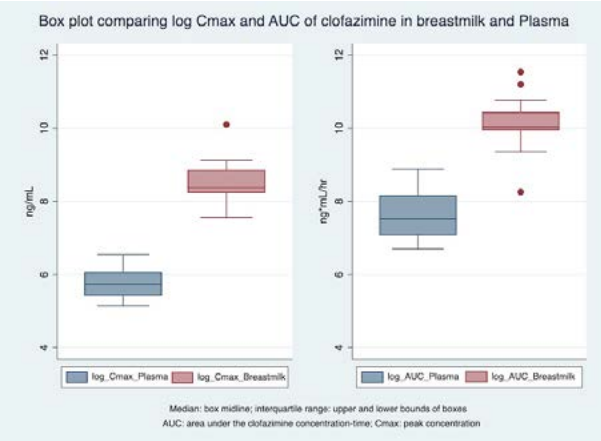
Background: There are limited data describing the exposure of clofazimine in the breastmilk of lactating women treated for rifampicin-resistant tuberculosis (RR-TB). Quantifying clofazimine pharmacokinetics in breastmilk is important to understand drug exposure in breastfeeding infants. We explored the relationship between maternal plasma clofazimine and breastmilk concentrations.
Design/Methods: We performed plasma and breastmilk sampling approximately six weeks post-partum in pregnant women treated with regimens including clofazimine 100 mg daily, in two studies in South Africa: BEAT-tuberculosis was a randomised control trial comparing a novel RR-TB treatment regimen with standard of care; and the King Dinuzulu Hospital study, an observational study exploring maternal and fetal outcomes in pregnant women treated for RR-TB.
We sampled blood and breastmilk prior to and at 2, 4, 6, 8 and 24 hours when available, after observed dosing. We used validated liquid chromatography-tandem mass spectrometry assays, and compared clofazimine peak concentrations (C_{max}) and area under the concentra-

tion time curve (AUC) in plasma and breastmilk. Using breastmilk clofazimine AUC, we calculated the external infant dose (EID) assuming an average infant breastmilk intake of 0.15 L/kg/day; the relative external infant dose (REID) was calculated using the recommended infant clofazimine dose of 2-5 mg/kg/day.

Results: Fourteen women (12 living with HIV, median age 30.5 yrs, median weight 61.5 kg) completed blood and breastmilk sampling. The median AUC of clofazimine in breastmilk compared with plasma was 22.74 versus 1.85 mg·h/L; the median C_{max} in breastmilk and plasma was 4.31 and 0.31 mg/L, respectively. The mean AUC and C_{max} (breastmilk/plasma) ratio of clofazimine was 12.5 and 18.8, respectively. The estimated EID of clofazimine is 0.20 mg/kg/day; the REID is 0.04 - 0.1.



Conclusions: We observed a substantially higher concentration of clofazimine in breastmilk than in maternal plasma, possibly due to the drug's lipophilicity. Implications for infant safety require further investigation.

OA10-196-19 Risk of TB infection in young children exposed to multidrug-resistant TB in the TB-CHAMP multi-site randomised controlled trial

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Background: Young children have a high risk of developing tuberculosis (TB) disease following infection with *Mycobacterium tuberculosis* in the absence of preventive treatment. Infection prevalence and risk factors for infection impact delivery of prevention strategies. We aimed to determine the risk of infection in child household contacts aged < 5 years exposed to adults with confirmed pulmonary multidrug-resistant (MDR)-TB and to determine risk factors for infection.

Design/Methods: TB-CHAMP was a trial of MDR-TB prevention that recruited children under 5, regardless of M.tb infection status. All children enrolled had an interferon-gamma release assay (IGRA) at baseline. We described *M.tb* infection prevalence, developed directed acyclic graphs to clarify causal relationships and used modified Poisson regression models to assess the relationship between risk factors and IGRA positivity.

Results: Of 785 included children, 160 (20.4%) had a positive IGRA. Duration of cough and illicit drug use in the index patient, age of the child, relationship between the child and the index patient and study site were significantly associated with risk of infection.

Conclusions: The prevalence of infection was lower than observed in previous studies. This may be related to improved diagnosis and treatment of MDR-TB in the study setting and/or test limitations and has implications for TB preventive treatment (TPT).

When considering TPT for child contacts, healthcare providers should be especially concerned about any young child exposed to an adult index patient who is his/her parent/primary caregiver, has a chronic cough and/or a history of illicit drug use.

OA10-197-19 Preventing TB and deaths among children living with HIV: The efficacy of TPT among children in a programmatic setting

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Background: Tuberculosis is a leading infectious cause of death globally, and is the top cause of death among those with HIV. The uptake of TB preventive therapy (TPT) among children has been inconsistent. Studies on TPT efficacy in young children across different settings have shown mixed results. This study aimed to assess the efficacy of TPT in reducing TB incidence and mortality within a programmatic setting.
Design/Methods: We performed a secondary analysis of the nationwide electronic patient management system (EPMS) documenting children being followed up for long-term HIV care and the electronic TB registers in Namibia. Probabilistic linkage was conducted using Registryplus Linkplus software to identify children who had registered episodes of TB. Only children under the age of 15 years at the time of enrolment were included. Survival analysis was performed using Stata 18.0.
Results: Of 24,379 children enrolled between 2002 and 2022 (53% female; median age 4; IQR 1-8), 128,879.5 person years were followed up with 92,762.2PY for those who received TPT (total 14,800 children; 60.7% of total enrolled). There were at least 1338 incidents of TB and 1118 deaths.
Incidence of TB was 0.68/100PY in the TPT group and 2.20/100PY in the no TPT group (IRR 0.34). The mortality rate was 0.34/100PY in the TPT group and 2.23/100PY in the no-TPT group (IRR 0.15). In a Cox regression model, the adjusted hazard ratio for getting TB was 0.53 (95%CI 0.47-0.61) for TPT; and 0.38 for antiretroviral therapy. For preventing deaths, the aHR was 0.27(95%CI 0.30-0.50) for TPT and 0.39 for ART.
Conclusions: In tthis national cohort of children with HIV, TPT proved to be highly effective across all age-groups in protecting against TB (47% reduction) and death (73% reduction). These results are consistent with those observed in adults and reinforce the continued recommendations and implementation of TPT for all CL-HIV

OA11 Life after TB: Priorities and opportunities in post-TB health and wellbeing

OA11-198-19 Previous pulmonary TB as a risk factor for lung functional impairment: A cross-sectional study in a rural area of Senegal

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Background: Post-tuberculosis (TB) lung disease (PTLD) is a growing concern in low-resource settings, yet its burden remains unknown.
Design/Methods: We conducted a cross-sectional study in Fimela district, Senegal, to assess respiratory function in adults who had completed pulmonary tuberculosis treatment (post-TB), compared to adults from the same area with no prior TB diagnosis but similar environmental exposure (controls).
The aim of this study was to quantify the prevalence and types of ventilatory patterns in both groups and to investigate whether prior pulmonary TB increases the risk of lung function impairment.
All participants completed standardized questionnaires on respiratory symptoms, exposure history to indoor and outdoor air pollutants, and smoking habits; they underwent clinical evaluation and spirometry with bronchodilator testing in case of obstruction. Chest X-ray was performed only in the post-TB group. Ventilatory patterns were classified using current guidelines.
Results: Among 242 participants (77 post-TB subjects and 165 controls) ventilatory impairment was observed in 59.7% of the post-TB group and 22.0% of controls ($p<0.001$). Restrictive patterns were most common (41.7% post-TB vs. 15.3% controls), while obstructive and mixed defects occurred in 13.9% and 4.2% of post-TB individuals, and in 6.7% and 1.3% of controls, respectively. Radiological abnormalities were found in 48.6% of the post-TB group, with fibrotic sequelae as the most frequent abnormality (40.3%) (Table 1). Multivariate analysis identified previous TB as an independent risk factor for lung function impairment [OR 4.44; 95% CI: 2.36–8.34], after adjustment for potential confounders, including exposure to air pollutants and smoking, none of which were significantly associated with the outcome.

	Total subjects n=142	Post-TB subjects n=77	Controls n=165	P-value
Median age, years (25-75IQR)	41.5 (29-57)	39.0 (29.0-52.0)	43.0 (29.0-58.5)	0.14
Sex (M), n° (%)	122 (50.4%)	51 (66.2%)	71 (43%)	<0.001
BMI, mean (+SD)	22.5 (+4.4)	19,9 (+3.2)	23.7 (+4.3)	0.02
HIV infection, n° (%)	4 (1.7%)	2 (2.6%)	2 (1.2%)	0.43
Actual or former smokers, n° (%)	46 (19.0%)	25 (32.5%)	21 (12.7%)	<0.001
Spirometric Alterations, n° (%)	76 (34.2%)	43 (59.7%)	33 (22.0%)	<0.001
Restrictive pattern, n° (%)	53 (23.9%)	30 (41.7%)	23 (15.3%)	<0.001
Obstuctive pattern, n° (%)	20 (9.0%)	10 (13.9%)	10 (6.7%)	0.08
Mixed disorder, n° (%)	5 (2.3%)	3 (4.2%)	2 (1.3%)	0.18

Conclusions: PTLD is associated with a high burden of ventilatory impairment in rural Senegal. Prior TB is a strong predictor of functional decline. Routine functional and radiological follow-up after TB treatment completion is feasible and valuable in rural low-income settings to detect lung functional impairment.

OA11-199-19 An assessment of abnormal 6 Minute Walk Distance (6MWD) and associated factors in people with post-TB lung disease at a tertiary hospital (Zambia): Cross-sectional study

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Background: Post TB lung disease (PTLD) can result in functional disability and remains a public health concern. Therefore, this study aimed to investigate the 6MWD outcomes and associated factors among adult PTLD patients presenting to the Adult University Teaching Hospitals (UTH), a tertiary health institution in Lusaka, Zambia.
Design/Methods: A cross-sectional study was conducted at the Adult University Teaching Hospital (UTH) between March 2023 and November 2024. Adults aged 18 and older with a history of treated TB, proven clinically or microbiologically, were included. Demographic and Clinical data were collected using a data abstraction form. Descriptive analysis and logistic regression were performed using STATA 15.
Results: The study included 105 participants, with a median age of 45 years (IQR 18-71). The median 6MWD was 345meters (IQR 279- 405). Individuals with abnormal 6MWD had a generally lower median BMI (19.8 vs. 22.2, p = 0.049). A higher proportion of individuals with abnormal 6 MWD had monthly incomes below $35 compared to those earning $180 and above (50% vs. 33.3%, 16.7%).
Additionally, breathlessness was more common among those with abnormal 6MWD than those presenting without this symptom (52.0% vs. 48.0%).
Females had higher odds of having abnormal 6 MWD compared to males (adjusted (aOR) = 6.99, 95% CI: 1.75–27.83, p = 0.006). Participants with fibrotic change were more likely to have abnormal 6 MWD compared to those without fibrotic changes (cOR: 0.36, 95% CI: 0.13–1.00, p = 0.050). Individuals experiencing breathlessness had higher odds of having abnormal 6 MWD compared to those without (aOR = 4.46, 95% CI: 1.22–17.51, p = 0.024).
Conclusions: The abnormal 6MWD among people with PTLD is common among those with low weight and significantly associated with breathlessness, low socioeconomical status and lung fibrosis. Disability related to TB remains a critical challenge and requires further research.

OA11-200-19 Patterns of pulmonary impairment before and after TB treatment

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Background: Despite growing awareness of the burden of post-TB lung disease (PTLD), our understanding of the natural history of TB-associated lung injury remains limited. In this study, we assess the prevalence and trajectories of pulmonary function patterns during and after TB treatment with comprehensive PFTs, including spirometry, lung volumes, and diffusion capacity of carbon monoxide (DLCO).
Design/Methods: In this ongoing prospective observational cohort study in Johannesburg, South Africa, adults with and without HIV were enrolled within two weeks of initiating treatment for a first episode of rifampin-suscep-

tible pulmonary TB. Participants completed chest x-ray (CXR) imaging and comprehensive PFTs including lung volumes and DLCO upon enrollment, with repeat PFTs at 6 months (TB treatment completion) and 12 months. PFT patterns were assigned according to ATS/ERS definitions. Agreement between PFT patterns across all timepoints was assessed using Cohen's kappa coefficient.

Results: Among 215 participants with baseline PFTs, most were male (70%), had a history of smoking (58%), and presented with moderate-to-severe disease on CXR (91%). At enrollment, 95 (44%) had normal PFTs, 62 (29%) had restriction, 27 (13%) had obstruction, and the remainder (31, 14%) had either a mixed or vascular pattern with an isolated reduction DLCO reduction. There were 85 participants with PFTs available at 12 months, of whom 47 (55%) had normal PFTs, 15 (18%) had restriction, and 14 (17%) had obstruction (Figure 1). There was moderate concordance across timepoints ($\kappa = 0.47$, $p < 0.001$ for baseline vs. 12 months, $\kappa = 0.60$, $p < 0.001$ for 6 vs. 12 months).

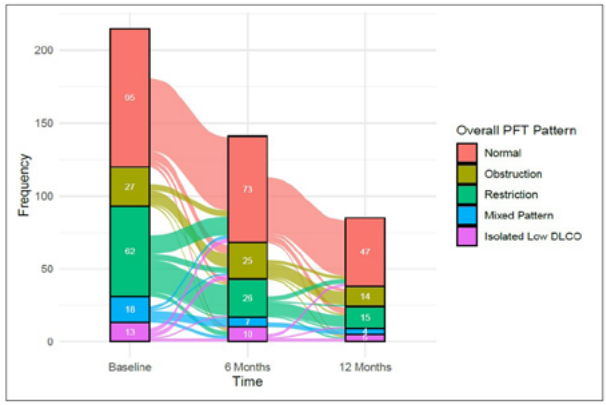

Figure 1. Sankey diagram of patterns of lung function at baseline (within 2 weeks of TB treatment initiation), 6 months (end of TB treatment), and 12 months after diagnosis. The flow of bands represents individual participant transitions between categories. Agreement between all timepoints was assessed using Cohen's kappa coefficient ($\kappa = 0.47$ for baseline vs. 6 months, $p<0.001$; $\kappa = 0.60$ for 6 vs. 12 months, $p<0.001$), indicating moderate concordance.

Conclusions: In individuals with newly diagnosed, moderate-to-severe pulmonary TB, a restrictive pattern of pulmonary function was the most common type of impairment. There was only moderate concordance between PFT patterns at TB diagnosis, treatment completion, and 6 months after treatment completion, suggesting significant heterogeneity in the natural history of TB-associated lung injury.

OA11-201-19 Trajectories of lung function in people with and without HIV during and after pulmonary TB treatment

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Background: While up to half of tuberculosis (TB) survivors have impaired lung function after TB treatment, the impact of HIV coinfection on lung function recovery remains unclear. This study aims to determine whether trajectories of lung function during and after TB treatment differ according to HIV and antiretroviral therapy (ART) status.

Design/Methods: For this observational cohort study in Johannesburg, South Africa, adults with and without HIV were enrolled within two weeks of initiating TB treatment for rifampin-susceptible pulmonary TB. Participants newly diagnosed with HIV were initiated on ART within two months of starting TB treatment, as per national guidelines. All participants completed comprehensive pulmonary function testing (spirometry, lung volumes (data not shown), diffusion capacity for carbon monoxide [(DLCO])) at enrollment, 1-, 6-, and 12-months. Lung function over time was compared using a Kruskal-Wallis test.

Results: Among 231 participants, median age was 36 years (IQR 30-44), 70 (30%) were female, and 104 (45%) had HIV coinfection, of whom 60 (58%) were not on ART at enrollment. Participants without HIV had a lower forced expiratory volume in one second (FEV1) and forced vital capacity (FVC) at enrollment than those with HIV, and had steady improvements in FEV1 and FVC during and after TB treatment (Figure).

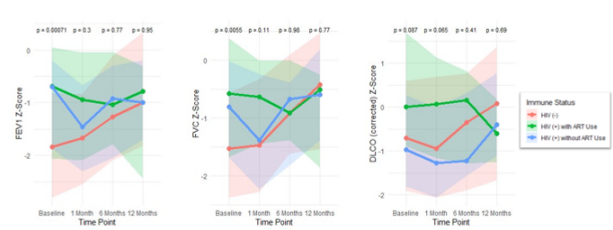

Figure 1. Line plots of median trajectories with shaded regions representing interquartile ranges for spirometry and diffusion capacity of the lung for carbon monoxide (DLCO) in participants with rifampin-susceptible pulmonary TB, with and without HIV and antiretroviral use at enrollment. Pulmonary function was assessed at the time of TB diagnosis and TB treatment initiation with repeat testing at 1-, 6-, and 12-month intervals. Between group comparisons were performed at each time point using Kruskal-Wallis testing. FEV1 = forced expiratory volume in one second, FVC = forced vital capacity, ART = antiretroviral therapy.

Participants with HIV had more variable trajectories, including early declines in FEV1 and FVC for those not on ART initially. DLCO at enrollment was lowest for those

with HIV not on ART and highest for those with HIV on ART. By 12 months, FEV1, FVC, and DLCO were similar irrespective of HIV and initial ART status.
Conclusions: We found differences in lung function at diagnosis and in trajectories of recovery during and after TB treatment by HIV and ART status. Future studies should explore whether this variability reflects differences in the pathophysiology of TB-associated lung damage with HIV coinfection.

OA11-202-19 Silent aftermath: Cardiovascular risks in post-TB survivors

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Background: Tuberculosis (TB) continues to be a leading infectious killer worldwide, with 10.6 million cases and 1.3 million deaths reported in 2022, primarily impacting low- and middle-income countries. Emerging evidence suggests that individuals who have completed TB treatment are at heightened risk of cardiovascular diseases, including ischemic heart disease, myocardial infarction, and atherosclerotic conditions. This increased risk is driven by persistent systemic inflammation, coexisting comorbidities, and inadequate management of latent TB infection, underscoring the need for integrated long-term care for TB survivors.
Design/Methods: A systematic review was conducted following PRISMA guidelines to evaluate the association between TB and subsequent cardiovascular disease (CVD) risk. Comprehensive searches were performed in Web of Science (n=44), Scopus (n=104), and PubMed (n=10), yielding a total of 158 records.
After removing duplicates and screening titles, abstracts, and full texts, ten studies met the inclusion criteria and were included in the final synthesis. The review focused on adults (≥18 years) with a history of completed TB treatment as the population.
Results: The included studies found a consistent association between TB survivors and increased risk of cardiovascular diseases. Large cohort studies showed TB survivors had higher risks of acute myocardial infarction (up to aHR 1.96), stroke (aHR 1.22–1.47), and cardiovascular mortality (aHR 1.63). The risk was highest during the acute post-TB phase. Pulmonary hypertension (PH) was observed in 4–9% of post-TB individuals, with risk increasing with recurrent TB. TB-HIV co-infection may further exacerbate cardiovascular risk, underscoring the need for long-term cardiovascular monitoring in TB survivors.
Conclusions: TB survivors face significantly higher risk for long-term cardiovascular diseases, including myocardial infarction, stroke, and pulmonary hypertension. Routine cardiovascular screening and follow-up should be integrated into post-TB care, especially for individuals with recurrent TB or coexisting conditions such as HIV infection.

OA11-203-19 Breaking the silence: The power of TB survivor stories in reducing stigma and fear

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Background: Tuberculosis (TB) remains a significant global health challenge, with stigma and fear creating substantial barriers to diagnosis, treatment, and social acceptance. Studies conducted in various settings have revealed that between 42% and 82% of TB patients experience stigma, making it one of the biggest obstacles to TB prevention and control. Misconceptions that TB is a death sentence or highly contagious have led to discrimination and social isolation of survivors, exacerbating their psychological burden. This study investigates how TB survivor stories can directly reduce stigma and fear, while promoting a more accurate understanding of TB and timely healthcare-seeking behavior.
Design/Methods: This qualitative study involved in-depth interviews with 12 TB survivors, selected through snowballing sampling method. Participants shared their experiences, challenges, and recovery journeys. Interviews were transcribed and thematically analyzed using NVivo version 15 to identify key themes such as resilience, community support, and the role of personal narratives in reshaping public perceptions of TB.
Results: The analysis identified several key themes:
1. Overcoming Isolation — Survivor stories highlighted the importance of social support in recovery, helping to break the social isolation that often comes with TB stigma;
2. Dispelling Myths — Firsthand accounts provided credible information that countered common misconceptions about TB, significantly reducing fear and stigma;
3. Empowerment and Advocacy — Sharing their personal stories enabled survivors to reclaim their dignity and advocate for TB awareness, thus promoting behavior change and supporting stigma reduction efforts.
These findings divulge how Survivor-led storytelling effectively reduces stigma, promotes early healthcare seeking, and serves as a community advocacy tool for TB control.

Conclusions: The findings demonstrate the transformative role of survivor storytelling in reducing stigma and changing public perceptions of TB. To maximize impact, TB programs should integrate survivor storytelling into public health campaigns, media advocacy, and community-based education efforts aimed at stigma reduction.

OA11-204-19 What's special about quality of life in TB: A qualitative appraisal of generic frameworks

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Background: Quality of life (QoL) is a complex construct focused on perceived wellbeing relative to culture, personal values and expectations and can be devastatingly low in tuberculosis (TB). Generic QoL framings may miss dimensions of wellbeing relevant to people with TB. We qualitatively appraised the applicability of two QoL frameworks to TB narratives collected in an endemic, peri-urban region of Eastern Cape, South Africa.
Design/Methods: From November 2023 to April 2024, private interviews were completed with thirty-three men and women (≥18 yrs) with pulmonary TB in diverse stages of treatment. Questions explored illness and treatment experiences, personal goals, and perspectives on various QoL domains. For the primary analysis, a coding framework based on the World Health Organization (WHO) QoL facets and Bury's process of biographical disruption in chronic illness was applied, adding novel codes as needed. For the secondary analysis, fit between theoretical frameworks and data was assessed by contrasting the original and the final coding framework, identifying gaps. An audit trail documenting coding framework changes, and analytical notes supported rigor.
Results:
Codes reflecting WHO facets in the physical, social, and independence domains were used frequently and highly relevant. However, codes related to social and emotional domains required adjustment to capture internalized, anticipated, and experienced stigma. Codes for nutrition and personal motivation were added. Participants strongly valued physical energy which was needed for work/employment, critical for advancing towards personal motivation.
The biographical disruption phases of increasing symptoms, seeking and disclosing diagnosis, mobilizing resources, and managing uncertainty were highly relevant. However, the individualized process did not adequately capture participants' interdependence with, and level of concern for family. (Figure 1)

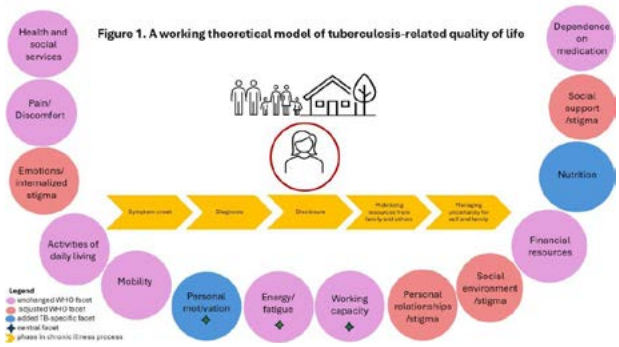

Figure 1.

Conclusions: WHO facets and biographical disruption are an appropriate but insufficient basis for a TB-QoL framework. Stigma, motivation, and family implications must be addressed to ensure QoL-enhancing interventions are meaningful for people experiencing TB.

OA11-205-19 Medium- and long-term post-TB sequelae burden and health-related quality of life in sub-Saharan Africa

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Background: There is still limited information on the mid-long-term burden of post-tuberculosis lung disease (PTLD) and its effect on health-related quality of life (HRQoL). The Post-TB SIQ study (ANRS405s), assessed the medium-long-term burden and HRQoL in sub-Saharan Africa.
Design/Methods: Former clinical trial adults (≥18years) in Benin, Guinea, Uganda were contacted 2-20 years after TB cure and invited for a comprehensive evaluation for PTLD. We conducted clinical assessment, spirometry,

six-minute walking test, chest X-ray, and administered the St George Respiratory Questionnaire (SGRQ) and the 36-item Short Form Health Survey (SF-36) for HRQoL assessment.

Characteristics	Categories	Total, n=600	Non-PTLD n = 339 (57%)	PTLD N = 261 (44%)	p-value
Age (years)#		43 (35, 52)	43 (35, 53)	43 (35, 52)	0.36
Male^		442 (75%)	187 (73%)	255 (76%)	0.36
Delay between end of TB treatment and assessment (years)	Median (IQR) (n=596)	11.1 (2.5, 11.6)	11.1 (2.5, 11.5)	11.1 (2.5, 11.6)	0.97
	> 10 years	309 (52%)	136 (53%)	173 (51%)	
	5-10 years	37 (6.2%)	22 (8.5%)	15 (4.5%)	0.089
	≤ 5 years	250 (42%)	101 (39%)	149 (44%)	
Comorbidities	HIV (n= 577)	204 (35%)	95 (38%)	109 (33%)	0.22
	Diabetes (n=598)	67 (11%)	27 (10%)	40 (12%)	0.60
	Smoking (n=598)	192 (32%)	69 (27%)	123 (36%)	0.01
	Alcohol dependance (Audit-C score ≥ 5) (n=598)	99 (17%)	38 (15%)	61 (18%)	0.28
Expositions	Use of Coal (n=598)	69 (12%)	30 (12%)	39 (12%)	0.98
	Household biomass combustion (n=598)	339 (57%)	157 (61%)	182 (54%)	0.09
Previous TB episode after end of trial (n=597)		28 (4.7%)	9 (3.5%)	19 (5.6%)	0.23
Clinical observations	BMI# (n=594)	21.0 (18.9, 24.2)	21.4 (19.3, 25.0)	20.8 (18.6, 23.5)	0.01
	Oxygen saturations#				
	Dyspnea grade ≥ 2 (n= 598)	98.00	98.00	98.00	0.02
	Hemoptysis (n= 595)	(97.00, 99.00)	(97.00, 99.00)	(97.00, 98.00)	0.10
	Hospitalization for respiratory infection*(n= 598)	70 (12%)	24 (9.3%)	46 (14%)	0.04
	Use of antibiotic for respiratory infection£ (n= 598)	56 (9.4%)	17 (6.6%)	39 (12%)	0.72
	Cough (n= 598)	11 (1.8%)	4 (1.2%)	7 (2.7%)	0.05
	Chronic bronchitis (n= 598)	81 (13.5%)	28 (8.2%)	53 (20.3%)	<0.01
	Poor exercise tolerance (modified Borg scale of perceived exertion ≥ 4) (n=581)	181 (30%)	59 (23%)	122 (36%)	0.76
	6minute walk test distance (m) (n= 582)#	11 (1.8%)	4 (1.5%)	7 (2.1%)	0.01
		21 (3.6)	6 (2.4)	15 (4.5)	0.47
		477 (417, 539)	480 (420, 530)	470 (410, 540)	
Chest X-Ray	Abnormal (n=598)	367 (62%)	110 (43%)	257 (77%)	<0.01
	Timika score ≥ 40 (moderate to severe lung damage)	80 (23%)	17 (17%)	63 (26%)	0.09
Health related Quality of life (HRQoL)	SGRQ score (n-597) Score from 0-100, the highest score indicates worse quality of life				
	Median (IQR)	7 (1, 20)	4 (0, 17)	10 (1, 22)	<0.01
	>10 (poor HRQoL)	271 (45%)	99 (38%)	172 (51%)	0.02
	SF-36 score (n-597) Score from 0-100, the lower score indicates worse quality of life				
	Median (IQR)	70 (55, 77)	72 (57, 77)	67 (52, 77)	0.33
	< 62 (poor HRQoL)	352 (59%)	157 (61%)	195 (58%)	0.41

Table.

*#:Median(Interquartile range); ^:effective(proportion); *:in the last 2years; £:in the last 12months*

A chest high resolution computed tomography (CT) scan was done for participants with clinical suspicion of bronchiectasis. We used the consensus definition of PTLD (according to GLI 2022 standards): presence of pulmonary functional impairment on spirometry and/or the presence of symptomatic bronchiectasis. Characteristics between PTLD and non-PTLD were compared using Chi-squared, Wilcoxon rank sum or Fisher's exact tests depending of the variable.

Results: A total of 600 participants were included. The median delay between TB cure to evaluation were 11.1years, 204 (35%) participants were living with HIV and 72 (12%) presented a dyspnea scale ≥2. Of the 551 participants that underwent spirometry, the patterns were: 45% (250/551) normal, 21% (118/551) obstruction, 25% (138/551) restriction and 8% (45/551) mixed. Symptomatic bronchiectasis was diagnosed in 14% (84/598) participants.

The proportion of PTLD was 57% (339/600). PTLD patients were more likely to have lower BMI, recent history of hemoptysis, poorer exercise tolerance, higher proportion of cough and abnormal chest X-ray, and poor HRQol (Table). About 34% (116/339) with PTLD had FEV1< -2.5 zscore.

Conclusions: PTLD, 2-20 years after TB treatment is highly common in sub-Saharan Africa. A poor HRQoL in people with past-TB treatment history is more prominent among those with PTLD.

OA11-206-19 Post-treatment outcomes three years after a 9-month regimen for rifampicin-resistant TB in Vietnam

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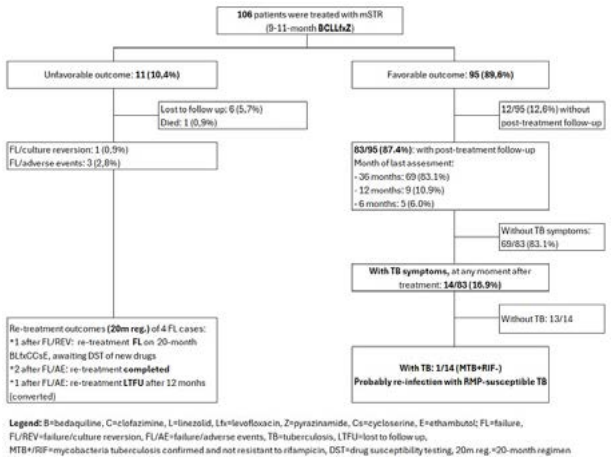
Background: WHO recently recommended a 5-drug 9-11-month rifampicin-resistant tuberculosis (RR-TB) treatment regimen including bedaquiline, levofloxacin, linezolid, clofazimine and pyrazinamide (BCLLfxZ) based on results of endTB clinical trial. In Vietnam, between 2020-2021, 106 patients were enrolled on BCLLLfxZ. We aim to show outcomes 36 months after treatment completion.

Design/Methods: Prospective cohort study until 36 months post-treatment after BCLLfxZ regimen for RR-TB without confirmed fluoroquinolone resistance.

Results: Of 106 patients, 95 (89.6%) had treatment success. Of 95, 83 (87.4%) had post treatment follow-up information; of which 69 (83.1%), 9 (10.9%) and 5 (6%) were assessed until month 36, 12 and 6, respectively. Of 14 (17%) with TB symptoms during post-treatment, one had a reinfection with rifampicin-susceptible TB. None had recurrent RR-TB 36 months after BCLLfxZ. Of 11 with an unsuccessful outcome, four had stopped due to adverse

events and converted on longer regimens (2 completed, 1 lost to follow up). One with bacteriological failure on BCLLfxZ also experienced failure during retreatment.



Conclusions: The study result showed high and sustained treatment success rate of 9-11-month BCLLfxZ regimen from endTB trial. Given that 6-month regimen including new drug pretomanid is not yet available in many settings, BCLLfxZ is a robust alternative for fluoroquinolone-susceptible RR-TB treatment.

OA11-207-19 Pulmonary rehabilitation for post-TB lung disease in Kenya: A mixed-methods study of implementation context

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Background: Pulmonary rehabilitation (PR) improves respiratory and functional symptoms in individuals with post-tuberculosis lung disease (PTLD) but is not widely available in high-tuberculosis (TB) burden countries, including Kenya. To understand contextual factors for implementing PR in Kenya, we assessed PR knowledge, attitudes, and practices among individuals treated for TB, healthcare workers (HCWs), and TB and healthcare leaders.

	Healthcare Worker (HCW) Survey (n= 200)	Individuals Treated for TB Interviews (n = 22)	Key Informant Interviews (n = 23)
Need:	• 90.5% of participants agree or strongly agree that enrolling patients with lung disease into a PR program is/would be beneficial. • 62.5% of HCWs felt that 50% or more of their patients with lung disease could benefit from a PR program.	• There is a strong need for establishing PR programs which involve specialists, doctors, and educators. • Greatest needs include breathing exercises, reducing stressful thoughts, exercise to promote a healthier lifestyle, advice to stop using cigarettes and alcohol, aerobic and stretching exercises, and strength training. • Flexibility in the cost, location (home vs hospital), and timing of the program was also considered very important, given that participation during work hours/days may act as a barrier.	• There is an urgent need for PR implementation for both children and adults, as many patients return to clinics without improvement and there is little to offer them. • Education directed to healthcare workers is needed about what PR is, why it is important, why multidisciplinary teams are needed, and which exercises improve lung function, symptoms, and mobility.
Capability	• 14% of respondents correctly identified the components of PR programs (aerobic exercise, strength and resistance training, tobacco cessation, dietary or nutritional counseling, inhaler technique counseling). • 27.5% selected an incorrect population for PR referral (i.e., chronic kidney disease or hypertension). • 30% disagreed or strongly disagreed with the statement that individuals with severe lung disease should participate in moderate-intensity activities.	• Most participants had never heard of PR. • Among those who had heard of PR, some confused it with spirometry or connected it with advice they had received about stopping tobacco use or alcohol. • A minority of participants were aware of PR, having heard about it from their physicians. They described blowing a balloon to help expand their lungs and going for walks.	• Most were aware of PR or at least the general concept of rehabilitation programs and could extrapolate that knowledge to PR. • There was a limited understanding of the details of what PR involves in terms of specific activities, location of service delivery, and patient populations, especially among clinical officers. • Consultant physicians were more knowledgeable about indications for PR and its components, but most of that knowledge came from reading about PR instead of seeing it first-hand.
Opportunity	• 36% of HCWs agreed or strongly agreed that PR is available and accessible for their patients. • The top 4 entities selected to take the initiative to start and/or expand PR programs were: 1. Kenyan Ministry of Health (77%) 2. National Referral Hospitals (74.5%) 3. County hospitals (71.5%) 4. County/sub-county clinics (61.5%)	• Once PR was explained, participants expressed a high level of trust in providers and were open to participating. • Believe PR could improve lung function, regain strength, enable them to return to work and improve their quality of life, and consider it an important and beneficial program. • Emphasize that education and exercise are key components that will significantly enhance their quality of life. • Barriers that would prevent participation include cost, transportation, limiting timing, and distance from their home to the hospital. Suggestions include offering sessions early in the morning, on specific days, or through online platforms to increase accessibility.	• There are currently no opportunities for enrolling individuals in a structured PR program, but if available they would be willing to do so. • Strategies that could facilitate implementation include providing local data to show PR can work in Kenya, establishing the infrastructure needed for PR, and collaborating with other sites where PR has already been implemented. • Determining how financing of the program and the cost to participants are key areas which could impact the opportunity to implement PR. • Resources are currently directed towards curative care, and sometimes prevention, and so participants felt they would need the Ministry of Health to help engage in PR implementation.
Motivation	• 88% of HCWs would refer patients with lung disease or respiratory symptoms to pulmonary rehabilitation.	• Personal motivation to regain health and return to normal daily activities drives desire to participate in PR. • Lack of knowledge about PR is discouraging. However, if available, clearly explained, and run and recommended by their doctors, participants would be motivated to join. They view medical advice as a strong motivator. • An assurance that their lungs would improve would be a motivating factor.	• Participants generally felt that PR was important to implement, would be beneficial to individuals with PTLD, and would be welcome. • Strong motivation to participate in education efforts to raise awareness of PR. • Physiotherapists and clinicians were motivated to start programs and receive training in PR.

Table 1: Joint Display of Survey and Interview Findings on CFIR Individuals Characteristics of Pulmonary Rehabilitation (PR) Implementation in Kenya

Design/Methods: We conducted a convergent parallel mixed-methods study in western Kenya between May and December 2024. This included a survey administered to HCWs via REDCap, semi-structured interviews with individuals treated for TB, and interviews with key informants (e.g. pulmonary physicians, TB care providers, hospital administrators, and national TB and health program leaders). Survey questions and interview guides

assessed PR implementation according to the Consolidated Framework for Implementation Research (CFIR). Descriptive summary statistics were calculated using SPSS. Interview transcripts were analyzed using rapid qualitative analysis, with a focus on the individual characteristics CFIR domain (e.g. need, capability, opportunity, and motivation).

Results: Of 340 HCWs contacted for the survey, 200 (55.5% female) responded, and we completed 45 interviews (22 individuals treated for TB; 23 key informants). Need and motivation for implementing PR was high across groups and in both survey and interview data (Table 1). However, the capability to implement PR is limited by poor awareness and knowledge about PR indications, components, and patient eligibility. For example, only 14% of HCWs correctly identified core components of PR and 27.5% selected an incorrect population for PR referral. Finally, several opportunities for PR implementation were identified, including high motivation among participants, trust in TB providers, close collaboration with the Ministry of Health, and piloting implementation.

Conclusions: To meet the high demand and motivation for implementing PR in Kenya, focused education and training for HCWs and raising awareness among individuals with TB will be essential.

OA11-208-19 Sustained effects of community-based pulmonary rehabilitation (PR) for adults with post-TB lung disease in Malawi

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Background and challenges to implementation: Follow-up and management of TB survivors has been ignored despite estimations of up to 2/3 of survivors presenting respiratory impairments after treatment. In Malawi, no protocols or guidelines existed for follow-up of TB survivors, and no PR program. The project thus implemented pioneer work aimed at demonstrating by proof of concept the feasibility and effectiveness of a low-cost PR by supporting TB survivors struggling with poor lung health, implementing a culturally appropriate, low-cost, community-based PR, measuring its sustained effect on health and wellbeing.

Intervention or response: We designed and implemented a community-based PR in nine districts in Malawi for 467 TB survivors with pulmonary complaints. Directly observed exercise sessions were done in groups of 16-25 people twice a week for 12 weeks. Data on 13 health variables was collected before and after the PR. A subset of 110 participants were followed up one year post PR and assessed again using the same data collection tools, enabling us to compare data on 13 variables at three stages: Baseline, endline and one year later. In-depth interviews were conducted with 7 of the 110.

Results/Impact: 110 TB survivors aged 20-80 were assessed. Preliminary data analysis shows that health gains from the PR were sustained one year after endline. Interestingly, the 6 Minute Walk test showed that endurance and functional capacity actually had increased, from a baseline mean of 397,6 meters, to 475,7 at endline and 480 one year after.

Also, symptoms such as cough continued to reduce with 56,4% experiencing cough at baseline, 9,1% at endline (12 weeks) and only 6,4% one year after.

Conclusions: The program had a significant positive effect on health and well-being, also one year after the PR, and it is now integrated in Malawi's National TB strategy. The benefits of such programs are immense, and we encourage other NTPs to follow.

OA12 Navigating TB therapy: Side effects, adverse events and tolerability

OA12-209-19 QT interval prolongation in children taking moxifloxacin and clofazimine for rifampicin-resistant TB treatment in South Africa, India and the Philippines

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Background: Clofazimine (CFZ) and moxifloxacin (MFX) are commonly used for the treatment of rifampicin-resistant tuberculosis (RR-TB). Both drugs prolong QT interval. We aimed to characterise the associations between their pharmacokinetics (PK) and the Fridericia-corrected QT interval (QTcF) in children treated for RR-TB.
Design/Methods: CATALYST was a multisite open-label trial evaluating the PK, safety and acceptability of MFX and CFZ in children <15 years treated for RR-TB. At study entry, participants had received MFX and CFZ for <16 weeks as part of routine optimized RR-TB regimens, with no restriction on concurrent bedaquiline (BDQ) or delamanid (DLM). Electrocardiograms with time-matched PK samples were collected at enrolment, and 16, 20, and 24 weeks on study. QTcF were analysed using nonlinear-mixed-effect modelling.
Results: Thirty-six children were enrolled [median 4.8 years old (range 0.4-15), 15.6 kg (range 6.9-42)]. Of these, 15 also received BDQ and 9 received DLM. Based on the final PK-QTcF model, the QTcF baseline, referring to 15-year-olds at RR-TB treatment start, was estimated at 416ms. QTcF in 5-month-old (0.4-year-old) children were typically 42ms lower than in 15-year-olds, reaching 50% difference by 4.9 years old. QTcF increased up to 7.1ms from baseline over time on treatment, reaching half-maximal effect at 7.5 weeks.
Drug effect for QTcF prolongation was modelled jointly for CFZ, MFX, and metabolites of BDQ and DLM, using a competitive antagonist model with effects of metabolites of extrapolated from adult studies. As shown in Figure 1, based on simulations using the final model, MFX primarily contributed to QT prolongation 2h post-dose at its peak concentration. CFZ and metabolites of BDQ/DLM drove prolonged QTcF effects over time, given their accumulative PK exposures (terminal half-lives range 1-5 months).

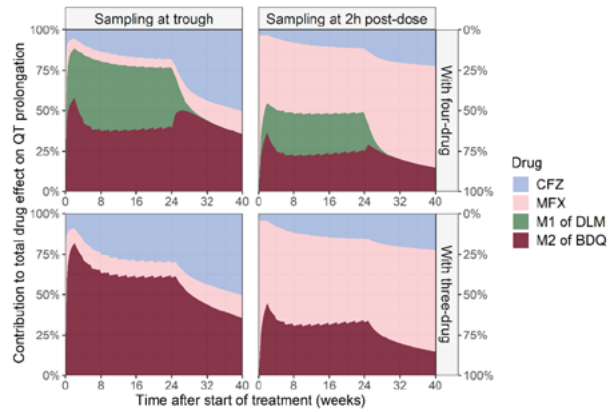

Figure 1: Model-predicted percentage contribution of TB drugs to total drug effect on QT prolongation with time after start of treatment. Four-drug and three-drug combinations of prioritised options for individualisation are visualised, including CFZ for clofazimine, MFX for moxifloxacin, M2 of BDQ for metabolite M2 of bedaquiline, and M1 of DLM for metabolite M1 of delamanid. The percentage contribution was illustrated for trough samples or 2h post-dose. The reference child is 16 kg in weight, 101 cm in height, 4.8 years old, female, non-black, albumin level of 4.45 g/dL, receiving CFZ 50 mg and MFX 300 mg daily for 40 weeks, BDQ 200 mg for 14-day loading phase and 100 mg Mon/Wed/Fri for 22-week maintenance phase, or additionally DLM 50 mg morning and 25 mg evening daily for 24 weeks.

Conclusions: Younger children had lower QTcF before and during RR-TB treatment. CFZ and metabolites of BDQ/DLM drove long-term QTcF prolongation, while MFX was the primary contributor at 2h post-dose.

OA12-210-19 Linezolid interruption and rechallenge, and their effect on clinical outcomes, in people with rifampicin-resistant TB: Appraisal of South African programmatic data from 2018 to 2022

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Background: Linezolid is a key component of treatment regimens for rifampicin-resistant/ multidrug-resistant tuberculosis (RR-/MDR-TB). Toxicity-related linezolid interruption is not uncommon, but little is known about its impact on treatment-related outcomes.
Furthermore, there are no data about the frequency of successful rechallenge and its associated predictors.

Design/Methods: We evaluated South African RR-/MDR-TB programmatic data from 2018-2022 using a national drug-resistant TB database. The frequency of linezolid interruption and rechallenge was evaluated. Odds ratios (ORs) for unfavourable outcome and rechallenge success were estimated using logistic regression.

Results: 83·7% of patients who received linezolid (10102/12064) met the study inclusion criteria and were included in the final analysis. 19·5% (1974/10102) interrupted LZD; the median time to interruption was 4·6 weeks.

After adjusting for age, HIV status, previous TB and smear status, linezolid-interrupters had 4·24 times greater odds of an unfavourable outcome compared to non-interrupters (95%CI 3·79–4·75; *p<0.001*). Only 3·3% (65/1974) of linezolid-interrupters were rechallenged with linezolid. Of those rechallenged, 72·3% (47/65) successfully completed their linezolid course.

Those successfully rechallenged had 4·03 times greater adjusted odds of favourable outcome compared to rechallenge failures (95%CI 1·03-11·70; *p=0·04*). A shorter time to initial linezolid interruption was associated with greater unsuccessful rechallenge and higher likelihood of unfavourable outcome (*p<0·001*).

Conclusions: Linezolid interruption was common and associated with unfavourable clinical outcomes. Linezolid rechallenge was frequently successful and associated with better clinical outcomes.

These findings inform clinical practice and have implications for management of patients receiving oral short course regimens for MDR-TB.

OA12-211-19 QTcF prolongation associated with bedaquiline-delamanid-linezolid regimens containing levofloxacin or moxifloxacin: A multicentre retrospective cohort study in rifampicin-resistant TB

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Background: The 6-month all-oral regimen combining bedaquiline, delamanid, and linezolid (BDL) with levofloxacin (Lfx) or moxifloxacin (Mfx) is increasingly used for rifampicin-resistant tuberculosis (RR-TB) in China. Given the QT-prolonging potential of fluoroquinolones, the comparative cardiac safety of Lfx versus Mfx in BDL regimens warrants evaluation.

Design/Methods: We conducted a multicenter retrospective cohort study involving RR-TB patients treated at three designated tuberculosis hospitals in Shenzhen, Beijing, and Changchun between December 2022 and December 2024. Patients were grouped into BDL, BDLL (containing Lfx), and BDLM (containing Mfx) regimens. Clinical data and electrocardiograms were collected. QT intervals were corrected using Fridericia's formula (QTcF). QTcF ≥500 ms or an increase ≥50 ms from baseline was defined as clinically significant prolongation.

Results: A total of 150 patients were included: 66 in the BDL group, 10 in BDLL, and 74 in BDLM. No baseline differences in QTcF were observed (P=0.509). Clinically significant QTcF prolongation occurred in 16.1%, 0%, and 4.1% of patients, respectively, within the first 4 weeks, with similar proportions during the entire treatment course. No statistically significant difference was found among groups. Regimen adjustments due to QTcF prolongation or drug intolerance occurred in 14 patients (9.3%), mostly requiring discontinuation of Mfx/Lfx while retaining the BDL core. No torsades de pointes (TdP) was observed. Multivariate analysis indicated that QTcF prolongation was associated with metabolic disease, electrolyte imbalance, cardiac disorders, and autonomic dysfunction; Lfx and Mfx were not independent risk factors.

Characteristics	ALL (N=150)	BDL (N=66)	BDLL (N=10)	BDLM (N=74)	P-value
Baseline QTc (ms)	445.87±43.36	446.98±44.62	430.40±53.67	446.99±40.93	0.509
QTc prolongation after baseline					0.085
Regular range	13(9.6%)	3(5.1%)	1(14.3%)	9(13%)	
Non-severe prolongation	80(59.3%)	39(66.1%)	6(85.7%)	35(50.7%)	
Severe prolongation	42(31.1%)	17(28.8%)	0	25(36.2%)	

Conclusions: Addition of Lfx or Mfx to the BDL regimen did not significantly increase the risk of QTcF prolongation or severe arrhythmias. A slightly better profile was observed for Lfx, though the sample size was small. QTcF prolongation was mainly associated with underlying comorbidities, underscoring the importance of risk stratification and ECG monitoring in vulnerable populations. Further studies are warranted to clarify cardiac safety differences among regimens.

OA12-212-19 Optimising tigecycline administration based on blood concentration monitoring in people with TB and NTM infections

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Background: Tigecycline (TGC), a glycylcycline antibiotic, shows promise in treating non-tuberculous mycobacterial (NTM) infections. However, its pharmacokinetics (PK) in patients with concurrent tuberculosis (TB) and NTM infections, particularly alongside P-glycoprotein (P-gp) inducers like rifampicin, remains unclear.
Design/Methods: A prospective cohort study enrolled 32 critically ill TB/NTM patients receiving TGC. Plasma concentrations were quantified via validated LC-MS/MS. A population PK (PPK) model was developed using nonlinear mixed-effects modeling, with evaluations including bootstrap analysis and visual predictive checks.
Results: Method validation demonstrated acceptable accuracy (85.0–115.0%) and precision (intra-day and inter-day relative standard deviation <15.0%) for TGC quantification. The cohort comprised 32 critically ill patients, yielding 224 analyzable blood samples.
PPK analysis identified a two-compartment model as optimal for characterizing TGC pharmacokinetics. Population estimates for key parameters were as follows: apparent clearance (CL/F) = 3.15 L/h; central compartment apparent volume of distribution (Vc/F) = 51.5 L.
Covariate analysis revealed body weight as the sole significant predictor of TGC PK variability ($p<0.05$), whereas age, hepatic function, and renal biomarkers showed no statistically significant influence.
Notably, concomitant administration with the P-gp inducer rifampicin exhibited no clinically relevant impact on TGC exposure parameters (AUC0–24 and Cmax; $p>0.05$).
Conclusions: This investigation successfully developed a PPK model for TGC in critically ill patients with TB/NTM co-infections. The findings underscore body weight as the primary covariate influencing TGC disposition, while concomitant P-gp inducer therapy did not significantly alter its PK profile. These insights support the rationale for weight-adjusted dosing regimens to optimize therapeutic efficacy in complex infections.
Nevertheless, external validation through multicenter studies with expanded sample sizes is warranted to enhance the generalizability of these conclusions.

OA12-213-19 Hepatotoxicity rates and risk factors within the endTB regimens approved for multidrug-resistant TB

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Background: Hepatotoxicity is a frequent adverse event of tuberculosis treatment and often leads to treatment interruptions and poor outcomes. We describe hepatotoxicity rates and associated risk factors within the three 9-month regimens recently endorsed as treatment options for rifampicin-resistant/multidrug-resistant tuberculosis (RR-TB/MDR-TB), consisting of combinations of bedaquiline (B), delamanid (D), linezolid (L), levofloxacin (Lfx) or moxifloxacin (M), clofazimine (C), pyrazinamide (Z) (endTB trial,ClinicalTrials.gov NCT02754765).
Design/Methods: We included participants of the safety population receiving 9BLMZ, 9BCLLfxZ, 9BDLLfxZ, and control standard-of-care. Hepatotoxicity was graded using the MSF Severity Scale. Investigators were encouraged to modify/withhold study drugs potentially related to ≥grade 3 adverse events. Cox regression was used to identify variables associated with ≥grade 3 drug-related hepatotoxicity and time to hepatotoxicity development was assessed.
Results: The rate of participants with drug-related hepatotoxicity ranged from 44.1% to 68.2%. Grade 3 or higher hepatotoxicity was reported in 5.5% to 16.7% participants in the experimental arms and in 6.3% in the control arm. Median time (weeks) from treatment initiation to the first ≥grade 3 event was 8 to 9.57 in the experimental arms and

11.5 in the control arm. Among participants experiencing a ≥grade 3 event who could not tolerate their full regimen, pyrazinamide was the study drug more frequently permanently discontinued (0.8%-5.6%), followed by bedaquiline and linezolid (0.8%-1.6%). Most participants recovered without complications; no deaths were related to hepatotoxicity (table).

After adjusting for age, region, baseline hepatitis status and baseline liver enzymes levels, being treated with 9BLMZ was the only variable associated with ≥grade 3 hepatotoxicity [adjusted Hazard Ratio 2.66 (95% CI 1.18; 6.04) p=0.019].

	Control n=126	9BLMZ n=126	9BCLLfxZ n=122	9BDLLfxZ n=127
	Hepatotoxicity events (all grades)			
Participants with ≥1 related event (n,%)	59 (46.8)	86 (68.2)	64 (62.5)	56 (44.1)
	Hepatotoxicity events (≥ grade 3)			
Participants with ≥1 related event (n,%)	8 (6.3)	21 (16.7)	12 (9.8)	7 (5.5)
Incidence/100 person-weeks (95% Confidence Interval)	0.08 (0.04-0.16)	0.22 (0.14-0.34)	0.12 (0.07-0.21)	0.06 (0.03-0.14)
Median time to 1st event weeks [Interquartile Range]	11.57 [4.93-44.93]	8.00 [4.00-19.86]	9.57 [4.79-18.71]	8.00 [3.86-8.14]
Death due to hepatotoxicity (n,%)	0	0	0	0
Participants with resolved ≥grade 3 events (n,%)	7 (5.6)	19 (15.1)	10 (8.2)	6 (4.7)
Permanent drug discontinuation due to hepatotoxicity (n,%)				
Bedaquiline	2 (1.6)	1 (0.8)	2 (1.6)	1 (0.8)
Clofazimine	1 (0.8)	0	2 (1.6)	0
Delamanid	0	0	0	1 (0.8)
Levofloxacin/Moxifloxacin	1 (0.8)	0	2 (1.6)	1 (0.8)
Linezolid	1 (0.8)	1 (0.8)	2 (1.6)	1 (0.8)
Pyrazinamide	1 (0.8)	7 (5.6%)	3 (2.5%)	2 (1.6)

Conclusions: Hepatotoxicity was common within the endTB trial, with significant differences among experimental regimens. Being treated with 9BLMZ was significantly associated with the development of ≥grade 3 drug-related hepatotoxicity. These findings should be considered to tailor the choice of the optimal regimen for MDR/RR-TB.

OA12-214-19 Incidence and risk factors of anti-TB drug induced liver injury: A multicentre retrospective study involving 482 Chinese paediatric TB patients

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Background: Anti-tuberculosis drug induced liver injury (ATDILI) is one of the most common and severe adverse reactions during the tuberculosis (TB) treatment. This study aims to investigate the incidence of ATDILI among children with TB and its related risk factors.

Design/Methods: A national multi-center retrospective study was employed to collect data from 11 representative children's specialist or general hospital for TB treatment. Outcomes of interest was the occurrence of ATDILI, and multivariable logistic regression analysis was performed to assess the impact factors associated with the occurrence of ATDILI based on different definitions in children with TB.

Results: Among 482 patients included in the study, based on different definitions, 18 patients (3.73%) and 51 (10.58%) experienced ATDILI, respectively. Among these patients, 11 out of 18 (61.11%) and 38 out of 51 (74.51%) were classified as having mild ATDIL. And the occurrence time was 0.70 (IQR: 0.23-1.23) months and 1.00 (IQR: 0.30-3.10) months after anti-TB treatment, respectively. The multivariate analysis results showed that based on definition 1, patients who using second line drug (s) in the intensive phase were more likely to experience ATDILI (OR =3.88, 95% CI: 1.40 ~ 10.76, P = 0.009). And for definition 2, patients with severe TB and using second line drug (s) regimen were more likely to develop ATDILI (OR = 2.18, 95%CI: 1.05 ~ 4.54, P = 0.037 for severity of TB; OR =2.76, 95% CI: 1.37 ~ 5.56, P = 0.005 for treatment).

Conclusions: In our study, there were differences in the incidence of ATDILI based on different definitions, but in general, mild ATDILI was dominant. Comprehensive

consideration of laboratory indicators and clinical practice, early identification and detection of ATDILI in children during anti-TB treatment, and timely intervention measures can effectively prevent and control the harm caused by ATDILI.

OA12-215-19 Hepatoprotective role of N-acetylcysteine in anti-TB drug-induced hepatotoxicity: A meta-analysis of controlled clinical studies

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Background: Anti-tuberculosis drug-induced hepatotoxicity (ATDH) is a significant complication that may compromise the efficacy of tuberculosis (TB) therapy. N-acetylcysteine (NAC), a glutathione precursor, has shown potential hepatoprotective effects in various clinical settings. This meta-analysis aimed to evaluate the efficacy and safety of NAC in preventing or reducing ATDH.
Design/Methods: A systematic search was conducted across five databases—PubMed, ScienceDirect, Cochrane Library, Web of Science, and Google Scholar—from inception to March 2025. Eligible studies included randomized or controlled trials comparing NAC with placebo or standard care in TB patients, reporting incidence of hepatotoxicity as a clinical outcome. Of the six included studies (n = 834), three were peer-reviewed full articles, and three were published conference abstracts. Data were pooled using a random-effects model, and risk of bias was assessed using Cochrane's Risk of Bias tool.
Results: The pooled analysis demonstrated a significant reduction in hepatotoxicity risk in the NAC group, with a pooled risk ratio (RR) of 0.32 (95% CI: 0.14–0.73). This indicates a 68% relative reduction in ATDH risk. Among the included studies, four reported significant improvements in liver biochemistry, including reductions in alanine aminotransferase (ALT), aspartate aminotransferase (AST), and bilirubin levels. NAC was generally well-tolerated, with no serious adverse events attributed to its use. Risk of bias across studies was moderate, with most concerns related to blinding and allocation concealment.
Conclusions: NAC significantly lowered the risk of ATDH and improved liver biochemical profiles in patients undergoing anti-TB therapy. Given its safety, affordability, and ease of administration, NAC may be considered an adjunctive protective agent, particularly in high-risk populations.
Further well-designed, large-scale, randomized controlled trials are warranted to confirm these findings and optimize clinical implementation.

OA12-216-19 Clofazimine pharmacokinetics in shorter treatment regimens for drug-sensitive TB

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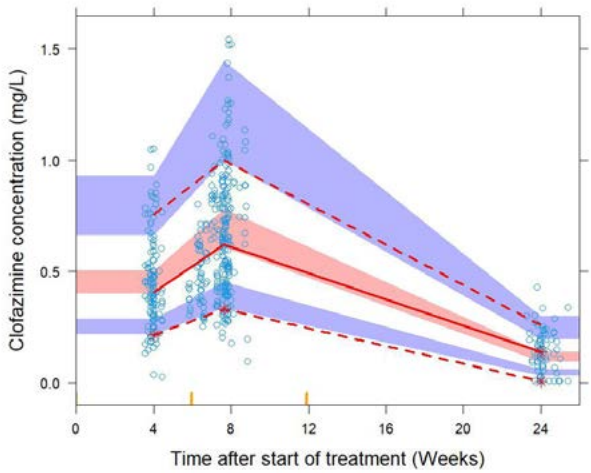
Background: Clofazimine (CFZ), recommended for treatment of drug-resistant tuberculosis, has extensive tissue distribution and long elimination half-life, with potential for post-treatment efficacy. Pharmacokinetics (PK) of CFZ used in ultra-short treatment regimens has not been described.
Design/Methods: We evaluated PK of CFZ (200mg, higher than conventional dose) administered with high-dose rifampicin (35mg/kg) and standard-dose isoniazid, pyrazinamide, ethambutol as a daily 8-week regimen in the TRUNCATE-TB (NCT03474198) trial. Blood sampling for sparse PK was done in all participants at weeks 4 (pre-dose and 2h post-dose), 8 (pre-dose and 4h), and 24 (anytime); and for intensive PK in a subset of participants at weeks 4 and 8 (pre-dose, 1, 2, 3, 4, 5, 6, 8 and 12h). Drug assay used liquid chromatography-mass spectrometry.
A previously-published, 3-compartment PK model (Abdelwahab et al, JAC, 2020), was used for analysis and to evaluate attainment of a putative efficacy threshold of 0.25mg/L (Swasnson et al, AAC, 2016).

Results: 490 (67% sparse) samples were available from 77 participants (18 with intensive PK) from Indonesia (48%), Philippines (42%) and Thailand (10%); 61% were male; median (IQR) weight 50 kg (44-58) and age 29 yr (24-41). With all other parameters fixed and allometric scaling by weight, we estimated CFZ clearance and terminal half-life of 7.46 L/h and ~50 days, respectively. The day 56 (Week 8) area under the curve (AUC_{0-24}, IQR) was 16.0 mg·h/L (11.1-20.6). CFZ levels were above the efficacy target in 84% at week 4, 100% at week 8 and 8% at week 24 (Figure 1).

Among participants who received greater than 42 doses, CFZ concentrations remained above the target for a median of 8.40 weeks (IQR: 3.80-11.6) following the last dose.



Conclusions: CFZ clearance was lower and elimination half-life longer than previously-published estimates. Concentrations likely persist at potentially-efficacious levels for a prolonged period after completion of an 8-week treatment regimen.

OA12-217-19 Adequacy of recommendations for adverse event management in national and international treatment guidelines for rifampicin-susceptible TB: A systematic review

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Background: Treatment-related adverse events (AEs) are common and have strong negative impacts on quality of life, adherence, and standard outcomes of treatment (treatment non-completion, treatment failure, recurrence, death during treatment). We performed a systematic review of treatment guidelines for rifampicin-susceptible TB to evaluate the adequacy of recommendations for AE management.

Design/Methods: We searched national TB program websites, guideline registries, PubMed, and mobile health Apps for TB to identify treatment guidelines. We also obtained national guidelines from the WHO-defined 30 high-burden countries for TB.

Results: We included 47 guidelines: 25 from high-burden countries, 12 international and prominent national guidelines, and 10 non-governmental guidelines. 37 guidelines (79%) included recommendations for managing adverse events: 24 (96%) of guidelines from high-burden countries, eight (80%) of those from non-governmental organizations, and four (33%) of international and prominent national guidelines (none of the 21 mobile health Apps had such recommendations).

Only four recommendations had formal ratings of supporting evidence. 27 guidelines (59%) included recommendations for managing nausea/vomiting, though only 8 recommended specific pharmacologic interventions, and only one recommended specific medication doses. Most guidelines (76%) included recommendations for managing hepatoxicity, and there was greater specificity than for nausea/vomiting.

Concerns identified in a qualitative evaluation of international guidelines included weblinks that did not function, difficulty in finding sections on AE management, and lack of specificity in the recommendations (see Table).

Conclusions: Despite their frequency and impact on treatment outcomes, international guidelines frequently lack recommendations for AE management. Treatment guideline should provide recommendations on management of adverse events, even if the evidence for doing so is of low quality.

Research on prevention and management of adverse events should be a priority for improving the patient's experience and the outcomes of tuberculosis treatment. Greater attention to ease of use of recommendations for adverse event management would help clinical staff.

OA12-218-19 Examining the differences and similarities of three adverse event grading systems used in TB clinical trials

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Background: Division of AIDS (DAIDS), Common Terminology Criteria for Adverse Events (CTCAE), and Médecins Sans Frontières (MSF) are prominent adverse event grading systems used in tuberculosis (TB) clinical trials. Differences and inconsistencies in the grading of drug-related toxicities may impact clinical trial and licensure outcomes.
Design/Methods: We compared adverse event grading criteria for 353 conditions across DAIDS, CTCAE, and MSF. We report on the nine most notable similarities and differences across cardiovascular, hematologic, psychiatric, hepatobiliary, and enzymatic/chemical disorder categories. DAIDS tables were obtained from the 2017 DAIDS Table for Grading the Severity of Adult and Pediatric Adverse Events, Corrected version 2.1. CTCAE adverse events tables were obtained from 2016 PV-TB-D12 TB Severity Grading Scale Version 5.0. MSF tables were obtained from the 2016 PV-TB-D21 TB Severity Grading Scale version 5.0.
Results: We found notable discrepancies in grade 3 and grade 4 severities for absolute lymphocyte count, neutrophil count, depression, anxiety, AST/ALT, hyperbilirubinemia, alkaline phosphatase, and creatinine levels. In general, many grade 3 AEs in CTCAE and MSF are grade 4 in DAIDS. Specific examples of concern include AST/ALT, alkaline phosphatase, and absolute lymphocyte count (Table 1).

	Source	Grade 3	Grade 4
Neutrophil Count (decreased)	CTCAE	500/mm^3 to <1000/mm^3	<500/m^3
	DAIDS	400/mm^3 to 599/mm^3	< 400/m^3
	MSF	N/A	N/A
AST/ALT and Alkaline Phosphatase	CTCAE	>5.0 to 20.0 x ULN	>20.0 x ULN
	DAIDS	5.0 to < 10.0 x ULN	≥ 10.0 x ULN
	MSF	>5.0 to 20.0 x ULN	>20.0 x ULN
Creatinine (increased)	CTCAE	>3.0 to 6.0 x ULN	>6.0 x ULN
	DAIDS	> 1.8 to < 3.5 x ULN	≥ 3.5 x ULN
	MSF	N/A	N/A

Psychiatric disorders are the most discrepant, with variable approaches to AE groupings and no specification of the screening criteria used for anxiety or depression. Grading criteria for QTc intervals are consistent across all grading systems. No group provided grading criteria specific to premature infants or pregnant women.
Conclusions: AE grading for TB therapeutics in clinical trials vary considerably across DAIDS, CTCAE, and MSF, particularly within hematologic, psychiatric, and hepatobiliary disorders. These inconsistencies may impact clinical decision-making, prematurely terminate active trials, and lead to improperly assigned warnings for new TB therapeutics.

OA13 Optimising community-based TB screening and finding people with TB

OA13-219-19 Who benefits from community-based active TB screening programs? Diagnostic yields, early detection, and demographics

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Background: A community-based mobile tuberculosis screening program, TB Móvil, has operated in Lima, Peru since 2019. From 2022-2023, TB Móvil conducted screening three days per week, targeting areas with previously observed high TB-screening yields. We evaluated the population reached by this screening and the TB diagnostic yield among key demographic groups.
Design/Methods: We compared the distributions of individuals screened and diagnosed with TB. We calculated the percentage of individuals that completed each stage of the screening process, including a chest radiograph, symptom screen, GeneXpert testing, and treatment initiation. We did this in aggregate, by age group and sex. We compare diagnostic test results, including smear positivity, to those from individuals diagnosed with TB at local health facilities from the same time period.
Results: TB Móvil registered 8,218 individuals for screening. Individuals aged 15-29, aged 80+, and men were disproportionately likely to be diagnosed with TB. Individuals aged 15-29 comprised 19% of those screened but 38% of those diagnosed (Figure).

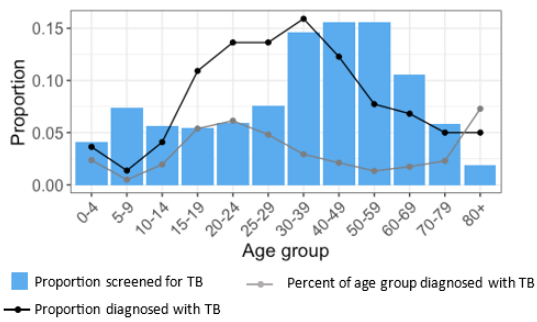

Figure. Distribution of population screened for TB and population diagnosed with TB by age group, and percent of each age group diagnosed with TB, resulting from one year of a mobile TB screening operation in Lima, Peru.

Of males screened, 4% were diagnosed with TB, compared to 2% of females. Among those with abnormal x-ray results, children aged 5-14 were less likely to complete symptom screening and further diagnostic testing than other age groups (52% versus 74%, c^2=6.3 p=.012). 17% of individuals diagnosed with TB by TB Móvil were smear positive, versus 54% of those diagnosed at local health facilities in the same area.
Conclusions: In this active screening program, TB Móvil effectively identified individuals earlier in their course of TB disease compared to individuals presenting at local health facilities. Youths and young adults (aged 15-29) were disproportionately diagnosed with TB via TB Móvil, indicating them as an important subgroup among which to focus future engagement strategies. To end the TB epidemic, global efforts must prioritize active screening to reach the undiagnosed earlier and target high-risk groups more effectively.

OA13-220-19 Enhancing tuberculosis screening integration in Malawi: Revolutionizing and enhancing uptake of community case-finding programs

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Background and challenges to implementation: Tuberculosis (TB) is still a major public health concern, especially in low- and middle-income countries. Community-based active case-finding (C-ACF) interventions have shown to increase TB detection rates, but their uptake has been declining in previous years of implementation. Informal community audits revealed that providing only screening services for a longer period communities loose interest, and in order to preserve access and increase uptake of ACF interventions, the program piloted integration of TB screening with other essential health services.
Intervention or response: The program used a mixed-methods approach, whereby program quantitative data (2018-2024) on key performance indicators, such as the number of people screened for tuberculosis, diagnosed, and treatment initiation, were reviewed and analyzed from 12 active TB screening intervention sites that use mobile digital X-rays for CXR and symptomatic screening.
In particular, for the years 2023 to 2024, performance review meetings with community members and health workers were intensified to have a wider understanding of some factors upon observing a decline in the number of people screened.
The community-based ACF integration approach was piloted in 2024 and integrated HIV services, malaria screening and testing, leprosy screening, syphilis testing, and hypertension screening and monitoring.
Results/Impact: TB screening findings (Table 1) for years 2023 and 2024, where integration was introduced, have shown an increase in the number of people screened for

TB from 128,535 to 217,129, with a marginal increase of 26%. In terms of screening by gender, 48% were males. In terms of TB case notification, there was also an increase from 1,164 to 1,408 with 100% treatment initiation.

Table 1: Integrated screening outcomes for community-based active TB case finding

Services	Year	People screened	Males screened	People screened/Tested positive	Males screened/Tested positive	People with TB	Males with TB	Clients referred for further management
Only TB Screening (CXR & Symptom)	2023	128,535	62,960	7,267	5,232	1,164	838	1,164
Integrated TB screening	2024	217,129	104,222	11,910	8,575	1,408	1,014	1,408
Hypertension screening	2024	13,206	5,316	2,122	961	1	1	2,122
HIV screening & Testing	2024	13,559	6,532	83	32	0	0	83
Leprosy screening	2024	116,290	50,979	1,559	96	0	0	1,559
Malaria screening & Testing	2024	4,187	1,661	1,322	559	0	0	1,322
Syphilis screening	2024	111	72	15	9	0	0	15
Diabetes Screening	2024	3,789	1,721	244	125	82	82	244

Conclusions: Community-based ACF is significantly more likely to be sustained when TB screening is integrated with necessary health services. This underscores the importance of holistic integration models in enhancing TB detection, and scaling up is one of the future recommendations to optimize TB control efforts.

OA13-221-19 Creative and comprehensive community engagement in community-based screening and treatment of TB infection and disease

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Background and challenges to implementation: Community engagement processes have been foundational in implementing a population wide screening (SWEEP-TB) in Daru, Papua New Guinea. The experience of COVID-19 vaccination awareness and provision in Daru provided valuable lessons in the need for multi-layered education and engagement of the community. Hence, multiple avenues have been used to inform and enable community members to take up SWEEP-TB services offered.
Intervention or response: A Community Advisory Group was developed in 2019 with 25 members and has provided ongoing essential cultural and contextual guidance on implementation of screening (e.g. messaging, security processes).
118 representatives from schools, churches, youth and women's groups and an organisation for people with disabilities have been trained and supported to provide education to their own group members. From June 2023 to March 2025, awareness was provided directly to 29,194 community members through the trained community representatives and structured awareness campaigns by the SWEEP-TB team. Other engagement avenues included a mural competition to decorate the screening truck, SWEEP-TB sponsored rugby teams, and activities at World TB Day and Independence Day celebrations.
Results/Impact: Interaction with the community prior to this project showed a lack of understanding of TB transmission and infection. However, the uptake of screening services has been high with 12,204 (54%) screened of the island population of 22,548 as of the end of February 2025. 171 of those screened have been diagnosed with active disease (150 initiated treatment), and 1,750 (75%) of 2,327 eligible people initiated on TB preventive therapy. This strong uptake reflects the impact of the community engagement approach in increasing understanding of TB and encouraging participation.
Conclusions: The multi-faceted community engagement approach has been effective in increasing knowledge of TB disease and infection and understanding of the importance of screening and treatment. The findings provide a roadmap for future interventions including in other settings in PNG.

OA13-222-19 Engagement of local market actors to expand the reach of active case finding: Impact of TB screening at daily markets in Bauchi State, Nigeria

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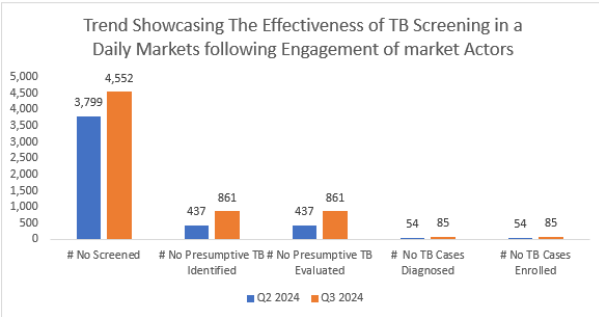
Background and challenges to implementation: Tuberculosis remains a significant public health concern in Nigeria still ranked first in Africa and 6th globally, with Bauchi State having one of the highest TB burdens in the country. Active Case Finding through community outreaches remains a critical strategy in detecting missing TB Cases in underserved communities with daily markets providing congregate settings where transmission occurs.
This paper presents the experience of reducing transmission and improving health outcomes as a strategy for community outreach using Wellness on Keke (WoK) focusing on the integration of daily Markets in Bauchi state.
Intervention or response: KNCV Nigeria deployed a mobile diagnostic unit called the WOK for active case finding in daily markets across 5 LGA's in Bauchi. In the initial phase, passive advocacy efforts were led by the Local Government Tuberculosis and Leprosy Supervisors (LGTBLS) to the market committees.
During the activity engagement phase, local committee leaders and mobilizers were engaged to enhance awareness creation and facilitate market screening participation. Data collected from participants included demo-

graphic information such as age & sex. Screening was conducted using the WHO 4-symptom screening tool. Sputum samples were collected from adults, while stool samples were collected from children. TB cascade data comparing results before and after the engagement of local market actors was collated and analyzed.

Results/Impact: Comparing Q2 and Q3 2024 we observed a 20% increase in the number of clients screened, with a 97% increase in number of TB presumptives identified and evaluated, the number of TB cases diagnosed also increased significantly by 57%.

Quarter	# No Screened	# No Presumptive TB Identified	# No Presumptive TB Evaluated	# No TB Cases Diagnosed	# No TB Cases Enrolled
Q2 2024	3,799	437	437	54	54
Q3 2024	4,552	861	861	85	85



Conclusions: TB screening at daily markets is an effective strategy for expanding the reach of ACF activities in Bauchi State. The intervention resulted in the detection of new TB cases that would have otherwise been missing and by leveraging existing social networks and cultural capital, we recommend a similar approach across the country.

OA13-223-19 Assessing the detection efficiency of community-based active case finding interventions across 7 waves of TB REACH

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Background: Tuberculosis (TB) is a preventable and treatable respiratory disease, yet remains the leading cause of death from an infectious disease globally. Active case finding (ACF) supports routine passive case finding by identifying people with TB earlier. However, ACF is costly, and the detection efficiency varies considerably between target populations and case-finding approaches. Since 2010, TB REACH supports interventions to increase TB notifications, many using community-based ACF interventions. Comparing the number needed to screen to detect one person with TB (NNS) as a measure of detection efficiency is useful for advising future ACF planning.

Design/Methods: 113 projects, comprising 198 interventions, were selected from TB REACH Waves 1- 7. Health-facility based projects and projects targeting specific risk groups (including contacts) were excluded. ACF TB care cascade indicators were abstracted from project reports: number screened, presumptive, tested, bacteriologically positive, and treated; as well as target population details, the screening and diagnostic tools applied, and where available, the pre-screening efforts. Crude NNS was calculated by dividing total number screened by total number of bacteriologically confirmed TB, combining data from all projects. Random effects meta-analysis of proportions (Stata's *metaprop_one)* provided a pooled overall NNS as well by intervention characteristics.

Results: Preliminary results showed a crude NNS of 293. The pooled NNS was much lower at 146 (95% CI 141-151) due to large, low-yield interventions inflating the crude NNS. We present an overview of the NNSs of TB REACH ACF interventions disaggregated by geographic region, case-finding strategy (Figure 1; excluding NNS>1000), target population, and screening and diagnostic tests applied.

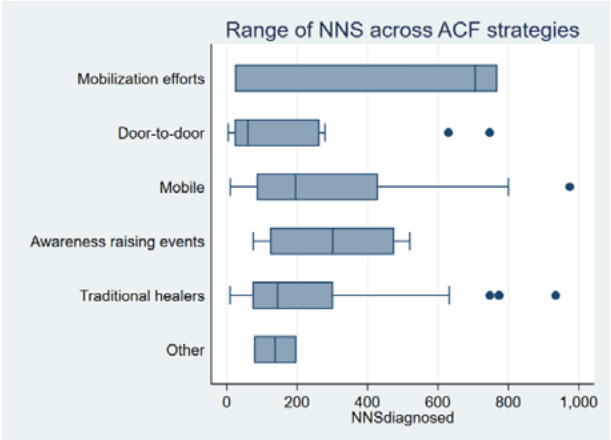

Figure 1.

Conclusions: We found substantial heterogeneity in NNS across ACF characteristics, limiting firm conclusions; however, our findings contribute to the knowledge base required to assess ACF efficiency. Standardized reporting on pre-screening awareness creation activities and size of the catchment population will be important to better evaluate future ACF efficiency.

OA13-224-19 Point-of-care molecular diagnostics for community-based active case-finding: A multicentre randomised controlled trial on TB detection and treatment initiation

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Background: Identifying the ideal active case-finding (ACF) strategy is critical to improving TB detection. We investigated the feasibility and impact of a point-of-care (POC) Xpert-driven ACF strategy in an open-label, multi-country randomised controlled trial to ascertain whether POC diagnosis is a critical component of an ACF strategy.
Design/Methods: We performed ACF using a mobile clinic fitted with a portable Xpert system and staffed by minimally-trained healthcare workers to screen passers-by in peri-urban areas of major cities in four African countries (South Africa, Zambia, Zimbabwe, and Mozambique). We compared treatment initiation failure in those randomised to diagnostic testing performed at (1) POC (battery-powered Xpert Ultra in the mobile van) or (2) in a centralised laboratory. Sputum culture was the reference standard.
Definite TB was defined as culture or Xpert Ultra positive. The primary endpoint was the arm-specific proportion of TB-positive individuals failing to initiate treatment over 60 days.
Results: Of 7506 individuals screened, 3288 (46·9%) participants at risk for TB were randomised (POC arm, n=1643; central arm, n=1645). 122/3288 (3·71%) had definite TB. Xpert detected 73·0% (65/89) of culture-positive TB overall. POC Xpert detected significantly more culture-positive TB than the centralised Xpert (35/37 [94·6%] versus 30/52 [57·7%], p<0·0001).
The probability of treatment initiation failure over 60-days (using Xpert + culture) was significantly higher in the central versus POC arm [RTML ratio 1·390 (1·088-1·775); p= 0.008]; and over 28 days: 1·633 (1·633–2·220, p=0·002).
Participants in the POC Xpert arm initiated treatment significantly faster (median time-to-treatment-initiation, [IQR]; 3 [1-8] versus 8 [3-24] days; p<0·001).
Conclusions: Community-based active case-finding using a point-of-care (POC) molecular tool is feasible in resource-limited settings. This strategy improves treatment initiation compared to centralised laboratory-based testing. These findings show that POC diagnosis is critical for an effective ACF strategy.

OA13-225-19 Mind the clinic-community gap: How concerned should we be about false positive tests in community screening?

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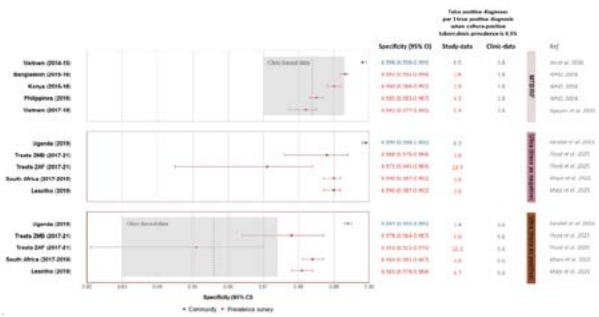
Background: Community-wide screening for bacteriologically confirmed pulmonary tuberculosis will likely reduce tuberculosis burden. However, concerns of false positive diagnoses and overtreatment remain due to subpar specificity of current bacteriological tests for screening. Current estimates of test specificity are widely used in planning of but are seldom based on performance in community studies.
Design/Methods: We reviewed and extracted test performance data of GeneXpert (MTB/RIF or Ultra) against culture in community-based studies, prevalence surveys and clinic-based studies. Community-based studies used Xpert as initial screening test, whereas in prevalence surveys Xpert was used for individuals who screened positive on symptoms and/or radiological abnormalities by chest X-ray. Using these data, we estimated Xpert specificity and determined the number of false positive diagnoses per one true positive diagnosis assuming a sputum culture-positive tuberculosis prevalence of 500 per 100,000. Our key comparator was Xpert performance against culture among individuals with presumed pulmonary tuberculosis in primary care facilities and local hospitals (per Zifodya 2021). Additionally, we calculated the required sample size to confirm specificity estimates in the community with a 95% confidence interval width of ±0.2.
Results: Xpert specificity in communities is underestimated when compared to clinic-based testing, both for Xpert MTB/RIF (community=99.8% [95%CI: 99.8-99.9]

vs clinic=98.4% [95%CrI: 97.0-99.3]) and Xpert Ultra (community=99.4% [95%CI: 99.3-99.5] vs clinic=95.6% [95%CrI: 93.0-97.4]). The number of false positive diagnoses was reduced by 86.8% and 85.4% for sputum Xpert MTB/RIF and Ultra, respectively (Figure). Sample sizes required to confirm these estimations in a community with a sputum culture-positive tuberculosis prevalence of 0.5% were 5,757 for an Xpert test specificity of 99.4% and 1,927 for a specificity of 99.8%



Conclusions: Clinic-based Xpert specificity likely overestimates the number of false positive Xpert diagnoses in community-wide tuberculosis screening. These findings further support its use in evaluation of community-wide screening for tuberculosis.

OA13-226-19 Game Changer – The role of mobile active case finding initiative in Cambodia under the USAID funded COMMIT project

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Cambodia, with an estimate of 35% of TB cases areundiagnosed. Limited access to quality diagnostic tools, inadequate healthcare management of resources, and ineffective interventions among service providers continue to hinder TB control efforts. As the population ages, TB prevalence may rise, further complicating containment and treatment strategies.
Intervention or response: The Community Mobilization Initiatives to End Tuberculosis (COMMIT) is a USAID-funded project aimed at improving TB case detection, prevention, and treatment support in Cambodia. This initiative employs a multi-pronged approach, combining community engagement and innovative screening methods. The intervention targets high-risk populations, including individuals aged 55 and older, the close contacts of pulmonary TB patients, diabetic patients, and symptomatic individuals. Screening is conducted using chest X-rays and Xpert MTB/RIF testing, ensuring early detection and accurate diagnosis.
Results/Impact: A comparative analysis of TB interventions in 2023 (previous initiatives) and 2024 (USAID-funded COMMIT program) revealed significant improvements in case detection across 13 operational districts. In 2023, other TB control initiatives identified a total of 3,093 TB cases, with 1,520 bacteriologically confirmed cases. In contrast, from January to September 2024, the COMMIT intervention detected 4,994 TB cases, including 2,677 bacteriologically confirmed cases. This represents a 161% increase in total TB cases and a 176% rise in bacteriologically confirmed cases. A key contributor to this success was Active Case Finding (ACF), which accounted for approximately 40% of newly identified cases, demonstrating the effectiveness of proactive detection methods.
Conclusions: Delivering quality TB services closer to high-risk populations has proven to be a transformative strategy. The USAID-funded COMMIT project demonstrated that targeted interventions, advanced diagnostic tools, and community-driven engagement significantly enhance TB detection and treatment outcomes.

OA13-227-19 Tuberculosis prevention and care in Madagascar: A mixed-method study investigating the determinants of community health workers involvement

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Background: With an estimated incidence of 233 cases per 100,000, Tuberculosis (TB) remains a major public health challenge in Madagascar. WHO estimates 45% of TB cases remain undetected. Although the country has 40,000 community health workers (CHWs) tasked with basic TB prevention and care, fewer than 5% are trained

specifically for TB tasks. This study investigates CHW involvement in TB prevention and care and identifies factors influencing their participation to inform strategies to strengthen community-based TB control.

Design/Methods: We conducted a mixed-methods study with a sequential explanatory design across four regions (Analamanga, Atsimo-Andrefana, Androy, Anosy). Between March and June 2024, a cross-sectional survey of 408 CHWs was conducted using two-stage cluster sampling to assess involvement in TB, support received, and work environment.

Additionally, 24 stakeholder interviews and five focus group discussions with CHWs explored contextual factors. Quantitative data were analyzed in R, including logistic regression; qualitative data were transcribed and analyzed thematically in NVivo.

Results: Of 408 CHWs, 96 (23.5%) reported any involvement in TB prevention and care. Among them, 91/96 (95%) engaged in sensitization, 47/96 (49%) in identifying and referring presumptive cases, and 23/96 (25%) in contact referral. CHWs with written work guidance (OR=2.41, 95% CI [1.44 - 4.08]) or with any prior training (OR=2.68, 95% CI [1.36 - 5.66]) were more likely to be involved. NGO collaboration was negatively associated with engagement (OR=0.45, 95% CI [0.45 - 0.80]).

Qualitative findings revealed several barriers to engagement, including limited overall and NGO support (e.g., lack of TB-specific training or protective equipment), disease-related stigma, the vulnerability of people with TB, and perceived infection risk for CHWs, contributing to a deprioritization of TB in comparison to other health topics.

Conclusions: CHW engagement in TB remains limited due to insufficient training, guidance, and support. Strengthening CHW capacity and addressing contextual barriers are essential for community-based TB control.

OA13-228-19 Strengthening TB policy through community-led monitoring: Multi-country evidence

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Background and challenges to implementation: Tuberculosis (TB) remains a global health challenge, with barriers such as stigma, access to care, and weak accountability hindering effective responses. Community-led monitoring (CLM) offers a promising approach to empower communities and drive systemic change, but its impact on national TB policies has been underexplored. The "One Voice, Many Lives" project aimed to analyze how CLM data, particularly through the OneImpact platform, influences TB policy and service delivery across diverse health systems.

Intervention or response: From July to December 2025, a mixed-methods study was conducted in seven countries (Ukraine, Kyrgyzstan, Moldova, Nepal, Philippines, DR Cameroon, Uganda). Using OneImpact data, we analyzed community-reported barriers to TB care, conducted 70 key informant interviews with policymakers and health providers, and held 35 focus group discussions with TB-affected communities.

Quantitative analysis compared TB service indicators (e.g., treatment success rates, diagnostic uptake) before and after CLM interventions, while qualitative case studies documented policy changes. Findings were mapped against WHO IHR Benchmarks to assess CLM's role in health system strengthening.

Results/Impact: The study gathered substantial community feedback via OneImpact, highlighting critical issues such as stigma and barriers to treatment access. In countries like Ukraine and Nepal, CLM data informed revisions to national TB guidelines, emphasizing patient-centered care. In Uganda, community advocacy contributed to reducing financial barriers to treatment. Across several countries, improvements were observed in treatment outcomes and service utilization, linked to CLM engagement.

Qualitative findings underscored enhanced accountability, with policymakers using CLM data to guide resource allocation. A set of proposed CLM benchmarks was developed, with initial adoption by national TB programs as a pilot framework.

Conclusions: CLM, supported by platforms like OneImpact, is a transformative tool for aligning TB services with community needs and strengthening health systems. Institutionalizing CLM as a standard practice can accelerate progress toward TB elimination and pandemic preparedness.

OA14 Predicting TB: New disease, reinfection and relapse

OA14-229-19 Integrated machine learning and proteomic profiling reveal host-specific response proteins as predictive biomarkers for tuberculosis diagnosis

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Background: Current immunodiagnostic tools for tuberculosis (TB) latent infection, including tuberculin skin tests and interferon-γ release assays, demonstrate suboptimal positive predictive values, leading to excessive prophylactic treatments.
This study aimed to identify high-accuracy protein biomarkers predictive of progression from latent TB infection (LTBI) to active TB (ATB).
Design/Methods: We analyzed QuantiFERON supernatants from a school TB outbreak cohort, longitudinally tracking 40 LTBI students over two years (21 progressing to ATB). Proteomic profiling quantified 1,248 serum proteins. Differential expression analysis identified ATB-associated proteins, with functional annotation through Gene Ontology (GO) and Kyoto Encyclopedia of Genes and Genomes (KEGG) pathway enrichment. A Random Forest model incorporating 3-fold cross-validation and oversampling techniques was developed to select predictive biomarkers and assess diagnostic performance using AUC, sensitivity, and specificity.

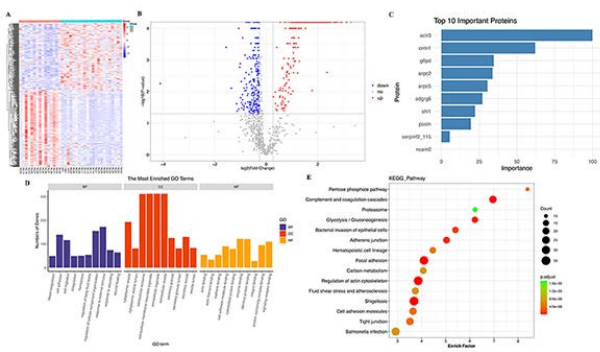

Figure 1. A ; Heatmap of protein expression profiles; B: Volcano plot; C: Gene Ontology (GO) enrichment analysis; D:KEGG pathway enrichment analysis; E:Feature importance ranking of the top 10 biomarker candidates from Random Forest classification model

Results: Comparative proteomics revealed 514 differentially expressed proteins between LTBI and ATB groups (276 upregulated, 238 downregulated). Cluster analysis demonstrated distinct expression patterns distinguishing disease states.
Key enriched pathways included phagocytosis (FDR = 2.1×10^{-7}), complement activation (FDR = 1.8×10^{-5}), and cell-matrix adhesion (FDR = 4.5×10^{-3}).
The optimized Random Forest model identified 10 predictive biomarkers (ACTR3, CNTN1, G6PD, ARPC2, ARPC5, ADGRG6, CHL1, POSTN, SERPINF2_115, NCAM2). Model performance peaked at mtry=2 with AUC=0.989 (sensitivity=90.1%, specificity=83.3%), significantly outperforming mtry=6 (AUC=0.985) and mtry=10 (AUC=0.985).
Conclusions: This study establishes a novel 10-protein biomarker panel that accurately predicts TB progression risk through machine learning-enhanced proteomic profiling. The high diagnostic performance suggests clinical utility for risk-stratifying LTBI populations, potentially reducing unnecessary chemoprophylaxis by 83% based on specificity estimates. Future multi-center validation and mechanistic studies on the ACTR3-mediated immune-stromal crosstalk could enable targeted interception of TB progression.

OA14-231-19 Exploring nuclear magnetic resonance metabolomics in serum samples for TB diagnosis in pediatric population: A pilot study

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Background: Recent research underscores Nuclear Magnetic Resonance (NMR)-based metabolomics as a promising diagnostic tool for early pediatric tuberculosis (TB) detection, capable of revealing a unique metabolic signature of disease.
In this study, we applied NMR spectroscopy to identify metabolomic fingerprints associated with TB in serum samples, offering a non-sputum-based method enhancing diagnostic accuracy.

Design/Methods: This pilot study included 30 subjects under 18 years of age from the Spanish Pediatric TB Network: 10 microbiologically confirmed TB (cTB), 10 with *Mycobacterium tuberculosis* infection (TBI), and 10 healthy controls (HC). Serum samples were collected at diagnosis, frozen for storage, thawed prior to analysis, and filtered by ultracentrifugation to remove lipid and protein constituents. High-Field NMR (500 MHz) and benchtop NMR (80 MHz) spectroscopy were used. Spectra analysis and metabolomic classification models via Partial Least Squares Discriminant Analysis (PLS-DA), cross-validation, and diagnostic performance metrics were conducted using Mnova software and Metaboanalyst 6.0, respectively.
Results: Participants had a median age of 8.45 years [1.9–18.2], with no differences between groups (cTB 8.05 [3.4–18.2], TBI 9.9 [4.7–15.4], HC 6.75 [1.9–14.4]). Two scenarios were evaluated using both HF-NMR and b-NMR spectroscopies: scenario 1 (cTB vs. HC) and scenario 2 (cTB vs. TBI). Accuracies exceeding 0.60 were achieved with both spectrometers. Sensitivity, specificity, and AUC-ROC values using HF-NMR were 90%, 100%, 1 (95% CI 1–1) for scenario 1 and 100%, 70%, and 0.95 (95% CI 0.77–1) for scenario 2, respectively. b-NMR yielded sensitivity, specificity, and AUC-ROC values of 100%, 90%, and 0.95 (95% CI 0.77–1) for scenario 1 and 80%, 70%, and 0.95 (95% CI 0.77–1) for scenario 2.

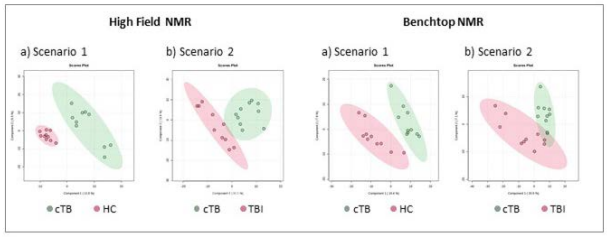

Figure 1. Two-dimensional view showing the distribution of the groups according to the first two components of the Partial least squares discriminant analysis (PLS-DA) model of serum spectra measured using both High Field NMR (H-F-NMR) and Benchtop NMR (b-NMR) spectroscopy. a) Scenario 1. Comparison between confirmed TB (cTB) and healthy controls (HC); b) Scenario 2. Comparison between confirmed TB (cTB) and MTB infection (TBI).

Conclusions: These findings underline the potential of NMR metabolomics potential for distinguishing pediatric TB from HC and TBI. Further validation with a larger sample size is needed to confirm these promising results.

OA14-232-19 Development of a four-gene host signature for paucibacillary TB diagnosis among individuals with Xpert MTB/RIF Ultra very low and trace results

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Background: The Xpert MTB/RIF Ultra (Ultra) assay is widely used for pulmonary TB diagnosis. However, how frequently a 'very low' or 'trace' semiquantitative Ultra result reflects paucibacillary TB versus a false positive is unknown, complicating diagnosis in the absence of confirmatory culture results.
New tools are needed to detect TB in individuals with low bacterial load, where standard diagnostics fail. This study assessed whether host transcriptomic signatures can predict paucibacillary TB when Ultra readouts are very low/trace and culture is unavailable.
Design/Methods: We performed transcriptional profiling from whole blood of symptomatic adults in Uganda, Kenya, and South Africa whose sputum underwent Ultra, MGIT and LJ culture testing. Using a customized NanoString Codeset covering 81 genes across 14 published TB signatures, we derived a novel four-gene host signature using machine learning algorithms (H2O.ai) ("Lopez_Trace_4"). Two independent validation cohorts were used to assess specificity. Sensitivity and specificity were calculated based on the minimum WHO targets for triage and diagnostic tests.
Results: Of 321 Ultra-positive participants, 90 had 'very low' or 'trace' results; 17 (18.8%) of these were culture-confirmed TB cases. In this group, our signature achieved an AUC of 0.88 (95% CI: 0.71-0.99) with 100% sensitivity at 70% specificity. It outperformed prior TB history as well as previously published transcriptomic signatures and showed high specificity in participants with other respiratory diseases and in TB-unexposed North American controls.
Conclusions: Our four-gene host signature showed high performance in identifying TB among culture-positive individuals with Ultra very low/trace results. The four-gene host signature outperformed the use of prior TB history or other published TB and met WHO TPP (designed for all, not just paucibacillary TB) for a triage test. With further validation, this blood-based test could be an effective triage tool for paucibacillary TB and exploratory biomarker for culture-negative TB.

	Diagnostic Sensitivity [95% CI][1]	Diagnostic Specificity [95% CI][1]	Triage Sensitivity [95% CI][2]	Triage Specificity [95% CI][2]	AUC [95% CI]
Comparator					
Prior TB history as a diagnostic[3]	0.33 [0.00-0.64]	0.53 [0.29-0.76]	-	-	N/A
Signature					
Lopez_Trace_4	0.33 [0.00, 0.83]	0.82 [0.65, 1.00]	1.00 [0.33, 1.00]	0.76 [0.59, 0.94]	0.88 [0.71, 0.99]
Darboe_RISK_11	0.33 [0.00, 0.83]	0.71 [0.24, 1.00]	0.67 [0.17, 1.00]	0.29 [0.12, 0.88]	0.76 [0.51, 0.96]
Zak_RISK_16	0.17 [0.00, 0.67]	0.71 [0.24, 1.00]	0.67 [0.17, 1.00]	0.29 [0.12, 0.82]	0.74 [0.49, 0.93]
Maertzdorf_4	0.00 [0.00, 0.50]	0.76 [0.29, 0.94]	0.67 [0.00, 1.00]	0.47 [0.24, 0.82]	0.70 [0.47, 0.90]

[1]Sensitivity and specificity are calculated at 0.98 specificity and 0.65 sensitivity, respectively, the WHO TPP required minimum for a biomarker-based non-sputum-based diagnostic assay for detecting TB.
[2]Sensitivity and specificity are calculated at 0.70 specificity and 0.90 sensitivity, the WHO TPP required minimum for a biomarker-based non-sputum-based TB screening assay.
[3]Prior TB history: consideration of a trace Ultra result as false positive in the presence of TB treatment. Diagnostic performance was assessed based on its association with culture positivity among very low- and trace-positive participants.

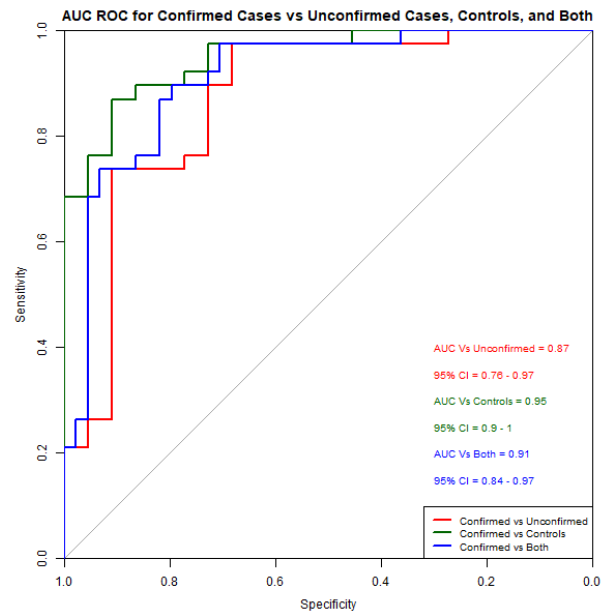

Figure.

OA14-233-19 Advancing extrapulmonary tuberculosis diagnosis and treatment monitoring with RISK6 transcriptomic biomarker

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Background: Diagnosing extrapulmonary tuberculosis (EPTB) is challenging due to diverse clinical manifestations of the disease, need for invasive sampling, and specialized processing. Furthermore, existing methods cannot monitor treatment efficacy, despite the frequent need to extend standard EPTB treatment regimens.
Therefore, we aimed to assess the RISK6 transcriptomic signature's performance for EPTB diagnosis and treatment monitoring in alignment with the WHO target product profile (TPP) for biomarker tests.
Design/Methods: We enrolled 382 individuals presumed to have EPTB and 35 healthy controls, all older than 11 years, from TB screening and treatment centers of icddr,b in Dhaka, Bangladesh, between March 2022 and March 2023. Different clinical samples were obtained depending on the clinical presentation of symptoms.
These samples underwent GeneXpert MTB/ RIF, culture, and microscopy testing to confirm EPTB. Blood samples were obtained from all participants at enrolment and post-treatment (for confirmed cases) to measure the RISK6 score via RT-qPCR. RISK6 signature performance was evaluated using the Area Under the receiver-operating characteristic curve (ROC AUC) and Student's t-test.
Results: Among 382 presumptive cases, 75 were microbiologically confirmed for EPTB and 307 were unconfirmed (not diagnosed with EPTB). Ongoing RISK6 testing is available for 38 confirmed cases at baseline (with post-treatment scores for 36), 22 unconfirmed cases, and 22 controls. RISK6 discriminated confirmed cases from controls (AUC 95%), unconfirmed cases (AUC 87%) and both groups combined (AUC 91%) (Figure). Furthermore, RISK6 scores for confirmed cases decreased significantly ($p<0.001$) post-treatment.
Conclusions: Our initial findings indicate that the RISK6 signature performance for EPTB effectively meets the WHO's biomarker test criteria in the TPP. RISK6 testing offers a promising development in EPTB diagnosis through a minimally invasive and accessible approach, particularly for challenging cases with insufficient evidence for biopsy. Furthermore, its post-treatment performance highlights a potential role in aiding clinicians to better elucidate treatment outcomes.

OA14-234-19 Prediction of tuberculosis by the QuantiFERON-TB Gold Plus assay in immunocompromised individuals: A prospective TBnet study

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Background: In low tuberculosis (TB)-endemic countries, preventive therapy (TPT) is recommended for immunocompromised individuals with positive immunodiagnostic tests. This study assessed the performance of the QuantiFERON-TB Gold Plus (QFT+) assay and its predictive value for TB progression in immunocompromised individuals.
Design/Methods: Immunocompromised adults – including people living with HIV (PLHIV), chronic renal failure, rheumatoid arthritis, solid-organ or stem-cell transplantation – and immunocompetent adults with and without TB were recruited from 11/2015 to 03/2019 at 21 sites in 11 European countries. QFT+ testing was performed at baseline; participants without TB were followed for incident disease.
Results: Among 1758 immunocompromised individuals without TB, 13.6% had positive QFT+ results. Sensitivity and specificity for TB were 70.0% (52.1-83.3%) and 91.4% (89.6-92.9%) in immunocompromised, and 81.4% (76.6-85.3%) and 96.0% (92.5-97.9%) in immunocompetent individuals. Addition of the TB2-tube conferred no added diagnostic benefit over TB1. Over 2457 person-years of follow-up (PYFU) among 932 non-HIV immunocompromised participants, no-one developed TB – even among 83 with positive QFT+ without TPT. In contrast, among 642 PLHIV without TPT, 3/30 PLHIV with positive and one with indeterminate QFT+ developed tuberculosis; all had detectable HIV-replication and low CD4 T-cell counts (incidence 4.1 [95% CI 1.3-12.4] per 100 PYFU).
No TB occurred among TPT recipients (269 PYFU). In comparison to immunocompetent controls without TPT and with negative QFT+ results, incidence rate ratios (IRRs) were markedly elevated in PLHIV with positive (IRR 44.3 [95% CI 4.6-426.0]) or indeterminate (IRR 216.0 [95% CI 13.5-3446.0]) QFT+ results. Aalen-Johansen curves confirmed increased cumulative TB risk in PLHIV with detectable HIV-load and low CD4 counts.
Conclusions: In low-endemic settings, TB risk among immunocompromised individuals is low, except among PLHIV with unsuppressed HIV and low CD4 counts. The QFT+ assay remains a poor predictor of TB progression. Moreover, the assay does not meet WHO performance targets as a non-sputum test for diagnosis of active tuberculosis.

OA14-235-19 Reinfection as a cause of recurrence involving drug-resistant bacilli arising from initially susceptible isolates in tuberculosis

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Background: The role of re-infection in the recurrence of tuberculosis cases involving a shift from drug-susceptible to drug-resistant bacilli remains unclear.
Design/Methods: Whole genome sequencing was performed on two or more Mycobacterium tuberculosis isolates from patients whose drug susceptibility profiles to isoniazid and rifampicin changed over time.
Results: Out of 6,228 culture-positive tuberculosis cases treated at Fukujuji Hospital between January 2005 and July 2022, 485 cases had multiple drug susceptibility tests conducted at intervals of at least 1.5 months due to persistent culture positivity. Among these, 10 cases exhibited changes in drug susceptibility patterns confirmed by both MGIT and broth MIC testing.
Six cases showed a shift from susceptibility to resistance to either isoniazid or rifampicin: In two cases, phenotypic resistance was observed early, with consistent genotypic resistance from the start.
In another two cases, phenotypic resistance developed alongside newly acquired resistance-conferring mutations. The remaining two cases involved genotypically distinct strains, indicating reinfection.
Four cases showed a reversal from resistance to susceptibility: One case was attributed to re-infection. Another demonstrated a genotypic shift from mutant to wild-type.
Conclusions: Re-infection or hetero infection explained two of the six cases that developed resistance during the study period.
Additionally, two cases appeared to acquire resistance during treatment. The frequency of drug resistance acquisition (to isoniazid or rifampicin) during treatment was 2 out of 6,228 culture-positive cases. Phenotypic drug

susceptibility tests occasionally demonstrated unstable results in the absence of corresponding genotypic mutations.

OA14-236-19 Whole-genome sequencing provides insights into recurrent tuberculosis in Madagascar over two decades

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Background: Identifying relapse versus reinfection in patients with recurrent tuberculosis (reTB) could help in developing effective public health and control strategies, as limited information is available on reTB worldwide. To address this knowledge gap, this study aimed to provide valuable molecular insights into reinfection versus relapse.
Design/Methods: We conducted a retrospective investigation on reTB episodes from 2002 to 2022 at the National reference laboratory for Mycobacteriology of Madagascar. *M. tuberculosis* (MTB) isolate strains from reTB episodes distanced for a period of 12 months from the same patients were selected. Strains were grown on liquid media and the DNA was whole-genome sequenced using Illumina Novaseq. A threshold of 12 Single Nucleotide Polymorphism (SNP) was employed to differentiate between relapse and reinfection among recurrent tuberculosis genomes and clustering analysis among datasets was performed.
Results: In total, 125 MTB isolates from 65 reTB patients were included in the study. Following whole-genome sequencing, the MTB Lineage 4 is accounting for 65.85% (n=28/41) of reTB-isolates, while Lineages 3, 2 and 1 represents 21.95% (n=9/41), 7.32% (n=3/41) and 4.88% (n=2/41) respectively.
A proportion of 57 % of the reTB was reinfection and 43% as relapse rates. Three cases of TB-drug resistance were observed from the second episodes of the reinfection case but none for the relapses. The clustering proportion among datasets were 66.67% (n=28/42).
Conclusions: These findings highlight the nature of reTB in Madagascar suggesting ongoing active community transmission, whereas the emergence of drug-resistant strains in reinfection cases raise concerns about the spread of drug-resistant strains.

OA14-237-19 The impact of prior tuberculosis on risk of subsequent TB in people living in households affected by tuberculosis – Results from the *ERASE-TB* study

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Background: Patients previously treated for tuberculosis (TB) are at risk of recurrent TB either through reinfection or relapse. Whether prior TB is an independent risk factor for subsequent TB, particularly in high-incidence settings, is currently unknown.
Design/Methods: We analysed the association between prior TB and TB identified as part of household contacts (HHC) screening among 2,109 HHCs aged 10 years and older. HHCs were enrolled across Mozambique, Tanzania, and Zimbabwe and followed every 6 months for a maximum of 24 months.
We estimated odds ratios (OR) with 95% confidence intervals (CI) using univariate and multivariable logistic regression, adjusting for age, sex, HIV status, and site, with household clustering as a random effect. Variable selection for multivariable analysis was guided by a directed acyclic graph (DAG).
Results: Median age of participants was 27 years (IQR 17–42), 38% were men. At baseline, 123 (5.9%) participants reported having been treated for TB in the past, median time since the last TB episode was 8 years (IQR 3–15). Participants with prior TB were older (median age 45 vs 25 years) and more likely to be living with HIV (46% vs 14%). Among 59 participants who were diagnosed with TB either at baseline or during follow-up, 9 (15%) had previous TB.
In the unadjusted analysis, the odds of being diagnosed with TB were higher in participants with prior TB (OR: 2.8, 95% CI: 0.73–11, p=0.13) compared to those without. In the multivariable analysis, prior TB was associated with an increased odds of TB (adjusted OR: 2.4, 95% CI: 0.61–9.7, p=0.21).
Conclusions: Prior TB was a risk factor for subsequent TB independent of age, sex and HIV status. Possible reasons are genetic susceptibility, persisting lung damage,

and other vulnerabilities on an individual or household level, which we did not measure or adjust for (residual confounding).

OA14-238-19 Timing of asymptomatic and symptomatic tuberculosis recurrence diagnoses after successful tuberculosis treatment completion in India

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Background: Patients completing tuberculosis (TB) treatment are at high risk of TB-recurrence in the subsequent year, and recurrent-TB might be present and potentially infectious (as indicated by *Mycobacterium tuberculosis* (*Mtb*) in respiratory secretions) before any symptoms develop.

Within cohort studies that performed universal microbiological testing at fixed intervals after treatment, we evaluated the timing of diagnosis of asymptomatic and symptomatic TB-recurrence.

Design/Methods: Participants >14 years of age in two prospective Indian cohorts (CTRIUMPh and TBDM), were followed up to 18 months after successful drug-susceptible pulmonary TB treatment (clinical response with or without microbiological evidence of cure). Sputum smear microscopy and cultures were performed six (TBDM) and/or twelve (TBDM and CTRIUMPh) months post-treatment, and at symptom-triggered visits.

Recurrent-TB diagnoses were classified as asymptomatic (no symptoms but positive smear or culture) or symptomatic (with or without positive mycobacteriology).

Results: A total of 752 patients with culture-confirmed TB and successful treatment completion were followed for median 10.9 (IQR:9.8-16.5) months post-treatment. Sixty-five (9%) developed TB-recurrence (incidence rate: 9.0% (95%CI:7.0-11.5%)/year). Of these, 22 (34%) were asymptomatic at the time of diagnosis (*Figure 1*).

Of the recurrent-TB diagnosed at study visits with scheduled microbiological testing, 11 of the 19 diagnoses at 6-month post-treatment visit, and 11 of 12 diagnoses at the 12-month post-treatment visit, were asymptomatic. Of the 43 recurrences that were symptomatic, 14 (33%) were diagnosed at scheduled study visits (with median reported symptom-duration 21 days [IQR:10-45 days]) and the rest through symptom-driven evaluations, but only 12 (38%) had completed negative microbiological testing between their end-of-treatment visit and TB-recurrence diagnosis.

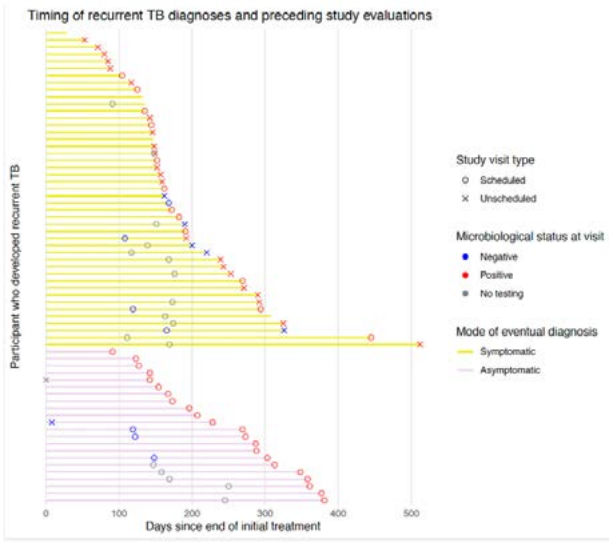

Figure 1: Time to recurrent TB diagnosis, and preceding study visits, for participants with recurrent TB. Each horizontal line represents the duration of post-treatment follow-up for one patient who was eventually diagnosed with recurrent symptomatic (lavender lines) or asymptomatic (yellow lines) TB. Study visits that occurred after the end of treatment are represented as shapes and are color-coded by microbiological status (smear and/or culture; positive if either had a positive result) at that visit.

Conclusions: Recurrent-TB occurred in 9% of TB patients and was often asymptomatic at the time of diagnosis, despite microbiological testing being performed infrequently. Some participants may have had prolonged asymptomatic TB prior to testing, and earlier, more frequent testing would likely diagnose a higher proportion at an asymptomatic stage.

OA15 Differentiated service delivery in precarious conditions

OA15-239-19 From silence to strength: How tuberculosis affected communities in Kenya are accessing justice through paralegal TB Champions

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Background and challenges to implementation: Tuberculosis (TB) is not only a global public health concern but also a human rights issue. TB-affected communities frequently experience stigma, discrimination, harassment, and systemic barriers that limit access to timely diagnosis, treatment, and justice. Kenya, listed among the top 30 high TB burden countries, faces critically low levels of legal literacy and access to redress mechanisms.
Studies indicate that over 60% of TB-affected individuals are unaware of their legal rights, and fewer than 10% know how to pursue formal redress. These barriers disproportionately impact individuals affected by TB and TB/HIV, perpetuating cycles of marginalization and poor health outcomes.
Intervention or response: In 2024, Kenya Red Cross Society in collaboration with its Sub-Recipients, the National Network of TB Champions and the National TB Programme, with support from the Global Fund, piloted a training of 60 TB champions as Community Paralegals in high TB -burden counties in Kenya. These champions, primarily TB survivors, were trained on legal frameworks, rights-based advocacy, documentation of violations, and referral pathways to strengthen legal literacy and address human rights violations among TB-affected communities. They conducted community legal literacy sessions, offered basic legal aid services, documented rights-abuses, and supported affected persons to access justice and healthcare services.
Results/Impact: From September 2024 to February 2025, paralegals documented 205 cases of human rights violations (144 female, 62 male), including 52 physical abuse, 36 verbal abuse, 34 stigma, 29 harassment, 18 land/inheritance disputes, 13 sexual abuse, 10 employment discrimination, 8 tenancy breaches, and 5 illegal arrests. 70% of cases were resolved through Alternate Dispute Resolution mechanism, legal aid, while the rest are in trial stages.
Conclusions: Empowering TB champions as Community Paralegals is a powerful community-led model that integrates legal empowerment into TB programming. Their dual role as both advocates and peers uniquely positions them to address barriers in access to care and justice.

OA15-240-19 Temporal trends and spatial clusters in tuberculosis treatment interruption among homeless people in Brazil

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Background: Homeless individuals are disproportionately affected by tuberculosis (TB), experiencing high treatment interruption rates due to structural vulnerabilities and healthcare access barriers. This study aims to analyze temporal trends and spatial clusters of TB treatment interruption among homeless people in Brazil, identifying associated sociodemographic, epidemiological, and programmatic factors.
Design/Methods: This ecological study evaluated TB treatment interruption indicators from 2015 to 2023 using national surveillance data. Temporal trends were analyzed using joinpoint regression, stratified by sociodemographic and clinical-epidemiological variables. A k-means clustering approach identified geographic patterns of treatment interruption based on correlations with contextual indicators, including social vulnerability, healthcare access, and programmatic factors. Statistical significance was assessed through confidence intervals for trend estimates.
Results: Treatment interruption increased among men (average quarterly percent change [AQPC]: 0.15%; 95% confidence interval [CI]: 0.04% to 0.29%), individuals aged 40–59 years (AQPC: 0.38%; CI: 0.25% to 0.53%), tobacco users (AQPC: 0.72%; CI: 0.61% to 0.82%), and those not receiving directly observed treatment (DOT) (AQPC: 0.49%; CI: 0.39% to 0.63%). The North (AQPC: 1.51%; CI: 0.96% to 2.21%) and Central-West (AQPC: 0.83%; CI: 0.17% to 1.59%) regions exhibited the highest increases in treatment interruption rates. Cluster analysis revealed four distinct spatial patterns: states with lower treatment interruption rates and better healthcare access; states with high social vulnerability, low educational levels, and primary healthcare deficiencies, showing significant treatment discontinuation; states with better socioeconomic indicators and moderate treatment interruption; and states with extreme social and healthcare inequalities, where TB treatment interruption rates were the highest in the country.
Conclusions: Socioeconomic and programmatic inequalities significantly impact TB treatment adherence among homeless individuals. Strengthening DOT programs, integrating TB care into social assistance networks, and expanding social protection policies are critical to improving treatment retention.

OA15-241-19 The role of informal health care providers in TB epidemic control in Nigeria

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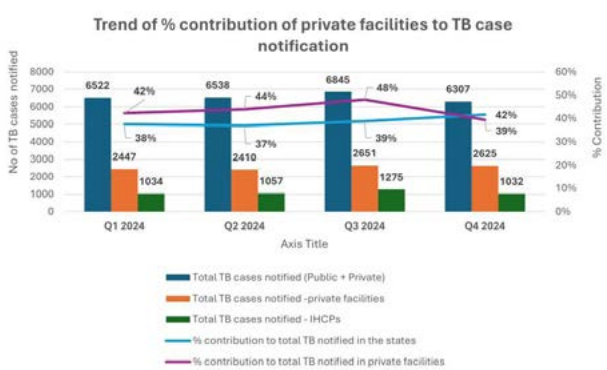
Background: Public and private sectors play significant roles in healthcare service delivery globally. In Nigeria, private health facilities (PHF) constitute a major part of the healthcare system, serving as the first point of contact for over 60% of Nigerians seeking care. This justified their engagement by the National Tuberculosis (TB) Program in TB control efforts in 2019. Since then, their contribution to total TB case notification has increased from 11% in 2017 to 33% in 2024, significantly increasing the TB treatment coverage from 25% in 2018 to 75% in 2024. The PHFs comprise of formal (private-for-profit and Faith-based organization health facilities) and informal healthcare providers-IHCPs (patent medicine vendors, community pharmacists, traditional birth attendants and standalone laboratories).
The study aims to highlight the contributions of IHCPs to the total TB case notifications in 2024 in four supported states of RedAid Nigeria under the Global fund-GC7 grant.
Design/Methods: A retrospective desk analysis of routine data collected from Benue, Delta, Edo and Taraba states in 2024 was conducted using MS Excel. Quarterly contributions of TB cases from the IHCPs were expressed as both absolute counts and proportions of total TB cases notified in the private facilities in these states.



Results: In 2024, a total of 26,212 TB cases were notified across the four quarters in the states. PHFs contributed 38–42% of the total cases. The proportion of TB notifications from IHCPs as a share of PHF contribution ranged from 42% in Q1 to a peak of 48% in Q3 before dropping to 39% in Q4.
Conclusions: The findings highlight the significant contribution of IHCPs in TB case notification, underscoring the importance of continued engagement and support for IHCPs in TB control strategies. Strengthening collaboration, capacity building, and resource allocation to IHCPs will further enhance TB case finding towards achieving the END TB targets.

OA15-242-19 Strategies employed to improve treatment outcomes amongst alcoholic TB patients in Korogocho informal settlements, Nairobi Kenya

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Background and challenges to implementation: Kenyan urban slums have the highest burden of TB due to overcrowding. Nairobi county contributes 15% of the TB cases reported in the Country. In 2022 cohort, 5% of clients in Kenya were lost to follow-up(LTFU), with Nairobi recording a slightly higher rate of 6% attributed to highly mobile impoverished populations and alcoholics. Korogocho, an informal settlement in Ruaraka Sub-county, Nairobi, which faces a significant tuberculosis (TB) burden, has been experiencing poor treatment outcomes,largely linked to alcoholism. Comboni Sisters, a faith based organization in Korogocho slums has been managing TB patients whom > 50% are alcoholics. In 2021, the facility reported a Treatment success rate among alcoholics of 61% (11/18).
Intervention or response: In 2022, the facility introduced an innovative approach to support alcoholic patients in adhering to their daily medication. This included providing daily porridge as they give DOTs and establishing support groups specifically for alcoholic patients. With the help of the TB champions, TB nurse, Specialized counselors (Mental health and gender-based violence counselors), nutritionist and the TB Coordinator were able to offer support on adherence, drug and substance abuse, stigma and discrimination, gender-based issues, nutrition and drugs side effects.
Results/Impact: Across the years the Treatment success rate among the alcoholics has been achieved as follows; In 2022, 21/22 (95%TSR), in 2023, 38/38 (100%TSR) and in 2024 January to September 50/50 (100%TSR) with an increase in case detection and good case retention across the years.

Conclusions: This study demonstrates that it is possible to achieve good treatment outcomes among st alcoholics with TB**.** Use of DOT plus strategy for patients who are alcoholics, psychological support and food incentive significantly improves drug adherence and reduces lost to follow ups.

OA15-243-19 From stigma to support: Rethinking TB care in factories and communities, a learning from India

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Background and challenges to implementation: Tuberculosis (TB)-related stigma continues to be a major barrier to diagnosis, treatment adherence, and patient well-being. Industrial settings where fear of job loss and social exclusion are prevalent hold additional challenges. TB Alert India implemented a project: IMA4TB (Industry Action & Management for TB) in Telangana State, India, under Stop TB Partnership (STP) CFCS Round 12.
Taking suggestion from UNHLM on TB political declaration from 2023 to include a target to end TB stigma, STP is rolling this out in a coordinated fashion across 15 countries.
Intervention or response: IAM4TB project fostered a TB-enabling environment in 160 high-risk industries across Telangana by training 320 TB Ambassadors, forming 122 Action Groups, and reaching nearly 21,000 workers through awareness sessions. Conducted X-ray screening camps and community-led monitoring, identifying and initiating treatment for 136 PwTB . A cross-sectional study with 152 PwTB (102 in intervention areas and 50 in control areas) was conducted with an aim to assess differences in stigma level, between intervention areas (project activities taken up) and control areas (project activities not taken up). Ethical approvals and informed consent were obtained from all participants.
Results/Impact: PwTB in intervention areas reported significantly lower stigma. Social exclusion was experienced by only 14% in intervention areas compared to 36% in control areas. Internalized stigma (feelings of guilt/shame) affected 18% of PwTB in intervention areas vs. 33% in control areas. Disclosure concerns were reported by 16% in intervention areas compared to 28% in control settings. PwTB in control areas expressed greater fear of discrimination and job loss, contributing to nondisclosure.
Conclusions: The IAM4TB project demonstrated that targeted, workplace-based stigma-reduction strategies such as employer engagement, peer education, and awareness activities can foster supportive environments. These approaches encourage early disclosure, timely treatment, and adherence. Scaling similar interventions across high-risk industries can strengthen community TB responses and improve outcomes for working populations.

OA15-244-19 Lessons learnt in the TB projects for the unhoused people of Delhi, India between 2017-2025 - Experiences of Humana People to People India

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Background and challenges to implementation: The urban, unhoused and underprivileged people have high TB-prevalence, and mortality due to chronic malnutrition, overcrowded living conditions, frequent migration, and poor accesses to health-services. Providing optimal services to those people was a long-standing challenge of the National TB Elimination Program (NTEP) of India. Humana People to People India (HPPI), a national-level NGO of India, had demonstrated the feasible ways to reach and serve the urban unhoused people of Delhi through various projects implemented between 2017 to 2025. HPPI chose Delhi as the implementation site because it houses more than 250,000 unhoused people, maximum among the metropolitan cities of India.
Intervention or response: HPPI implemented the projects within different time-frames and durations, in partnership with external funding agencies, local foundation, and the NTEP, and with the help of dedicated outreach workers and project-teams.
The overall chief activities of the projects were TB screening with different modalities (symptomatic, Chest x-ray, AI-based cough-sound), linkage-development to the local NTEP services, treatment education and adherence support, addressing stigma, gender and human right issues, community engagement by empowering and mobilizing TASA (TB Affected Street Activists), and SAHELI (local women groups), and facilitating multi-sectoral collaboration to optimize socio-economic support for the unhoused PwTB.
Results/Impact: The projects were chiefly responsible for detection of missing PwTB in the urban unhoused communities. Additionally, the intensified follow-up and tracking systems established by the projects for the PwTB decreased high mortality and LTFU rates. Strategic community engagement enhanced community voices, repre-

sentation, de-stigmatization and gender responsiveness. They also mobilized different partners to further support the unhoused PwTB with supplementary nutrition, and civic amenities.

Project name	Period	Target groups	# screened	# pre-sumptive	# tested	# PwTB	#PwTB detected per 100 people screened
Homeless TB Project (Azim Premji Philanthropic Initiative)	Dec'17 to Aug'19	Unhoused population	24538	864	585	233	1
Homeless TB Project supported by HPPI internally	Nov'19 to Oct'21	Unhoused population	8283	421	261	90	1
LEAD 1 (Leveraging Engaging Advocating to disrupt TB transmission), supported by USAID	May'23 to Jul'24	Unhoused population, migratory population, people living in unauthorized slums	154601	6225	5158	1547	1
Interim Project between LEAD 1 and LEAD 2	Aug'24 to Oct'24	Unhoused population, migratory population, people living in unauthorized slums	780	177	172	24	3
LEAD 2 (Leveraging Engaging Advocating to disrupt TB transmission), supported by USAID	Oct'24 to Jan'25	Unhoused population, migratory population, people living in unauthorized slums	26334	2784	2394	241	1
TASA (TB Affected Street Activist) supported by Round 11 of CFCS grant, Stop TB Partnership	May'23 to May'24	Unhoused population	7994	228	201	93	1
SWEET (Street Women Engaged and Empowered to stop TB) supported by Round 12 of CFCS, Stop TB Partnership	Dec'23 to Jan'25	Unhoused population	1946	158	85	51	1
Total			224575	10857	8856	2279	

Conclusions: The HPPI-led projects had displayed that we can optimize TB services for urban unhoused people with community-friendly and convenient outreach programs, high-quality screening, dynamic facilitation of service-utilization at the NTEP, need-based patient and family-centred care, and active engagement of community-members and multiple stakeholders.

OA15-245-19 Urban gardens: A sustainable food supplementation model for persons with TB and their families in Lusaka, Zambia

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Background and challenges to implementation: Persons with TB (PWTB) require 20–30% more calories and protein than healthy individuals to support recovery and immune function (WHO 2022). Malnutrition in PWTB is associated with treatment failure, adverse drug reactions, prolonged recovery, and increased mortality risk. Furthermore, PWTB face food insecurity, exacerbated by loss of income due to stigma, disability and discrimination. An estimated 5.8 million Zambians (33%) experience high level food insecurity exacerbated by climate change, with a TB incidence rate of 283/100.000 (20250116_ACAPS).
Intervention or response: This study examined the effect of Urban gardens/ bachelor beds to support food supplementation among PWTB and their urban households. A DAPP (local NGO) project was implemented in three high-TB burden urban shanty compounds (kombonis) of Lusaka, Zambia. Over one year (2024-2025) DAPP provided basic lessons in urban gardens techniques to each volunteering households (HH) of PWTB in the project. 46 households established gardens and were regularly monitored to assess garden growth, collect participant feedback, and track changes in household nutrition and food security.
Results/Impact: 46 urban gardens for 46 HH (from only very few at baseline) were established during the project. Families produced tomatoes, onions and green vegetables which in long periods fed 4 to 6 members of the HH 2 days a week. Within six months, 80% (n=37/46) households reported improved dietary diversity. Weight gain were reported in 70% (n=32/46) of HH. Twenty percent (n=9) at times generated surplus produce for sale, improving households' livelihood. Participants also reported improved mental well-being, as gardening fostered community involvement.
Conclusions: Findings highlight the potential of urban gardens as a scalable, low-cost intervention to enhance TB recovery, mental well-being and economic resilience. Strengthening health promotion within TB programs can increase food production and improve outcomes. A multidisciplinary approach with integrated support systems to enhance food production should be considered in high TB burden settings.

OA15-246-19 Leave no one behind TB care: New vulnerable population group has appeared following the start of full-scale war in Ukraine

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Background and challenges to implementation: Immediately after the russian invasion to Ukraine in February 2022 mass mobilization began in Ukraine. The need to significantly increase the size of the active army to confront the invader made it impossible to adhere to the medical protocols for examining conscripts at military commissariats.
As a result, large number of people with TB (known or undiagnosed) joined acting army in 2022. Poor living conditions and huge stress of militaries have enabled TB infection spread among the military contingent.
There is a limited access to TB diagnostics services in militaries, since all military hospitals/clinics/units prioritize aiding for injuries and traumas, not focused on TB. In late summer 2022, Alliance responded to a request from Medical Forces of the Armed Forces of Ukraine (MFAFU) to provide support with TB diagnostics among military contingent close to the frontline.
Intervention or response: For this purpose, Alliance allocated the mobile ambulance (MA) equipped with X-ray, Gene-Xpert, refrigerator, generator, modem, solar panel etc. and leased it to MFAFU for operation. MA is capable to work remotely for a long time.
Mobile team consists exclusively of the personnel of MoD, while Alliance provides technical assistance to MA team (trainings, monitoring visits) as well as support to the MA work (petrol, technical service, insurance). MA team reports to Alliance and together they plan MA work and assess the project results.
Results/Impact: MA started working in February 2023 and partnership has enhanced the TB case finding within the militaries.

	# of MA visits	# of persons screened	TB cases diagnosed	NNI	Enrolled in treatment	Other pulmonary pathology diagnosed
2023 (11 months)	74	16,884	91	186	91	-
2024	61	8.556	73	117	73	249

Conclusions: Collaboration between Alliance and MFAFU continues and there is a plan to expand this collaboration in 2025 in the Ministry of Internal Affairs specially targeting reserve soldiers. Collaboration includes training for MA staff, TA and join planning of the MA work. There is a greater need expand these services and equip MA with the Starlink and electronic warfare device to prevent its damage.

OA15-247-19 First statewide differentiated TB care: Care cascade and death rate reduction in 2024

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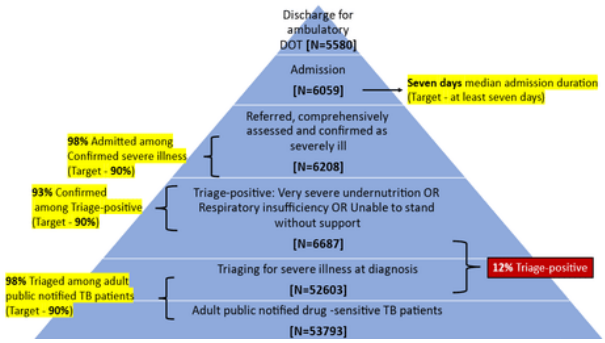
Background: To address high TB mortality, Tamil Nadu (a southern Indian state) implemented differentiated TB care from April 2022, based on successful pilots of a triage tool in Karnataka (2020) and Gujarat (2021). The Tamil Nadu *Kasanoi Erappila Thittam* (TN-KET), meaning „TB death-free project," aimed to triage adults with TB at diagnosis for high risk of death. Triage-positive (very severe undernutrition or respiratory insufficiency or poor performance status) were prioritized for referral, comprehensive assessment, and inpatient care in all TB districts except Chennai (n=30 districts), the capital city (*Figure*).
After adjusting for potential confounders, TN-KET was associated with 20% and 11% reduction in early and overall TB death rate in July-September 2022 diagnosis cohort when compared to January-March 2022. Sustained assessment of care cascades and effect on TB death rate needs to be documented.
Design/Methods: Cohort study involving secondary data extracted for Severe TB Web Application (TB *SeWA*) – the case-based severe TB information management system of TN-KET and *Ni-kshay* – the case-based TB information management system of TB program.
Results: In 2024, of 53 793 adults with TB diagnosed from public facilities, 52 603 (98%) were triaged and 6687 (12%) were triage-positive (eligible for referral). Of 6687 eligible, 6208 (93%) were referred, comprehensively assessed and confirmed as severely ill at nodal inpatient facilities.
Of 6208 confirmed, 6059 (98%) were admitted for inpatient care and 5580 (92%) were successfully discharged for ambulatory care. The median admission duration was

seven days (*Figure*). When compared to baseline, among the July-September 2024 cohort, 25 districts have documented at least 20-30% reduction in reported TB death rate.

Figure. TN-KET care cascade, 2024



Conclusions: In the third year of TN-KET, the losses in the TB care cascade have significantly reduced and many districts have documented reduction in TB death rates. This effect needs to be confirmed through confounders adjusted individual level data analysis and is ongoing.

OA15-248-19 Inuit experiences and expertise on the 21st century tuberculosis epidemic in Nunavik, Quebec, Canada: A qualitative community-based participatory study

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Background: In the mid-20th century, Canadian federal and provincial governments addressed high tuberculosis rates amongst Inuit through colonial policies centered on forced removal to distant sanatoria causing significant individual and societal trauma. In Nunavik, the Inuit homeland in Quebec (Canada), tuberculosis incidence has risen again in the 21st century, and in 2024 reached 150-times the Quebec average. We undertook the first-ever investigation to understand Nunavik Inuit („Nunavimmiut“) experiences with tuberculosis care in the 21st century.
Design/Methods: A community-based participatory action research project working with Nunavik's health authorities, leaders, and an Inuit steering committee. Indigenous researchers (First Nations & Nunavimmiut) conducted interviews and focus groups with Nunavimmiut about tuberculosis and healthcare experiences. Iterative data analyses used constructivist grounded theory and Indigenous Research Methodology within a reconciliation framework, and considered service delivery challenges observed in outbreaks occurring during the research. We report policy recommendations that emerged from data analysis.
Results: From 2022-2023, we interviewed 156 Nunavimmiut in 5 Nunavik communities and Montreal. Nunavimmiut shared a strong desire to protect individual and community health, which contrasted with under-resourced health services. Contemporary tuberculosis care pathways and interventions were themselves identified as sources of hardship from cultural and linguistic dissonance of health services, displacement for investigation and treatment, isolation requirements, lack of support, and stigma. The paucity of Inuktitut language in health services contrasted with its supremacy in day-to-day life. A paradigm emerged of program-centered tuberculosis services, arising in part from under-resourcing. Healthcare workers largely echoed these perceptions. Nunavimmiut recommendations for improving their tuberculosis experiences included increasing Inuit agency over services and data, Inuit healthcare workers, greater support for affected individuals, and increasing local services to minimize displacement.
Conclusions: Nunavimmiut called for shifting from program-centered to person-centered and community-driven tuberculosis care, which will necessitate increasing resources and entrenching Inuit agency over services through reconciliation- and decolonization-aligned policy changes.

SHORT ORAL ABSTRACT SESSION (SOA)

SOA03 Refining the performance of computer-assisted TB diagnostics

SOA03-523-19 Man vs machine: A comparative analysis of AI-assisted screening and community referrals for TB detection under the C-PAT project

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Background and challenges to implementation: The Community-led Patient Active TB Case Finding (C-PAT) project, implemented across Telangana, Uttar Pradesh, and Bihar, aimed to enhance early TB detection among underserved populations.
Two complementary strategies were adopted:
1. AI-enabled handheld X-ray screening through organized camps, and;
2. Community-led referrals of people with TB-like symptoms (PTS) by trained local stakeholders.
These approaches were introduced to address persistent challenges of delayed diagnosis, and limited access, settings.
Intervention or response: A total of 241 screening camps were conducted in collaboration with local health centres, using portable AI-powered X-ray devices used for screening and followed by diagnostic test TB identification.
In parallel, 314 community stakeholders—including women self-help group members, key opinion leaders, and members of village-level local self-governance bodies—were trained and supported to identify and refer individuals with TB-like symptoms.
All those identified were linked to appropriate testing for TB, with logistics facilitated for sample collection and transport.
Results/Impact: Over the course of one year, 8,754 individuals were screened using AI-enabled handheld X-ray tools, resulting in 51 people diagnosed with TB (0.5%). In contrast, in just three months, 1,172 individuals were referred by 314 community stakeholders, with 37 people diagnosed with TB (3%).
While artificial intelligence enabled large-scale, standardized screening, the human intelligence of community stakeholders—rooted in local knowledge and trust—proved six times more effective. This demonstrates the strength of combining technological scale with social precision.
Conclusions: The C-PAT experience shows that blending innovation with grassroots engagement creates a powerful hybrid model for TB detection. Integrating AI tools with community networks can significantly enhance case finding in resource-constrained, high-burden settings.

SOA03-524-19 Optimizing TB screening using chest X-ray with computer-aided detection: Diagnostic efficiency across threshold scores to assist human reading

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Background and challenges to implementation: Chest X-ray (CXR) remains a crucial screening tool for identifying tuberculosis (TB) through standard human interpretation. However, reading variability and resource constraints can limit its effectiveness. The emergence of computer-aided detection (CAD) systems provides a scalable alternative for automated screening, as they quickly analyze CXRs using artificial intelligence algorithms. Comparing CAD performance across different thresholds to human readings is essential for optimizing diagnostic efficiency.
Intervention or response: In selected cities in the Philippines, systematic TB screening utilized CXR with CAD to identify presumptive TB alongside radiologist readings. Retrospective data were analyzed using molecular World Health Organization-recommended rapid diagnostic test (mWRD) as the reference standard, covering the period July 2022-March 2024.
The assessment addressed diagnostic performance, threshold scores at 95% and 90% sensitivity, and TB diagnostic efficiency indicators, including number needed to test (NNT), missed cases, and saved mWRD.
Results/Impact: Using a 0.50 threshold, 2,087 individuals were screened with 229 diagnosed TB cases. The CAD demonstrated a 96% sensitivity and 42% specificity, while human readers achieved 83% sensitivity and 59% specificity. Increasing the CAD threshold to 0.56 optimized sensitivity to 95% and improved the rate of saved confirmatory testing from 38% to 42%. While enhancing specificity and resource efficiency, a 0.70 threshold significantly increased the number of missed cases from 9 to 22.
Compared to human readings, CAD detected more cases with a similar range of positive predictive values but fewer missed cases. Its adjustable thresholds allowed for programmatic trade-offs between sensitivity and resource use.

Variable	Total N=2,087[a]	mWRD (+) N=229 (11%)	mWRD (-) N=1,858 (89%)
Sex Male Female	937 (45%) 1,150 (55%)	141 (62%) 249 (38%)	796 (43%) 1,062 (57%)
Mean age (range)	52.7 (15-90)	47.4 (15-84)	53.4 (15-90)
Age Groups 15 to 39 40 to 59 60 and older	481 (23%) 743 (36%) 860 (41%)	74 (32%) 82 (36%) 72 (32%)	407 (22%) 661 (36%) 788 (42%)
CXR with CAD results TB Presumptive TB Negative	1,292 (62%) 795 (38%)	220 (96%) 9 (4%)	1,072 (58%) 786 (42%)
Human Reading Results TB Presumptive TB Negative	959 (46%) 1,128 (54%)	191 (83%) 38 (17%)	768 (41%) 1,090 (59%)

Table 1: Demographic and clinical description of participants tested by mWRD.

Parameters	No triage test[b]	Human Reading	Chest x-ray with CAD		
			0.50[c]	0.56	0.70
Performance metrics					
Sensitivity	-	83%	96%	95%	90%
Specificity	-	59%	42%	46%	57%
PPV[d]	-	20%	17%	18%	20%
Efficiency measures					
mWRD done	2,087	959	1,292	1,216	1,015
mWRD saved	-	1,128 (54%)	795 (38%)	871 (42%)	1,072 (51%)
TB cases detected	229	191	220	217	207
TB cases missed	-	38 (17%)	9 (4%)	12 (5%)	22 (10%)
NNT	-	5.0	5.9	5.6	4.9

[a] From FHI 360 data
[b] Representing mWRD testing-for-all scenario
[c] AUROC = 0.86 (95% CI: 0.83, 0.88)
[d] Positive Predictive value

Table 2: Performance metrics and efficiency measures at different CAD threshold scores

Conclusions: Understanding the differences between CAD and human reading performance on CXR is essential for strengthening screening strategies, particularly when balancing case detection with resource constraints. CAD systems can enhance the efficiency of TB screening and offer flexible, threshold-based tuning to maximize sensitivity while effectively managing resources.
The findings highlight CAD potential to complement human interpretation and improve TB diagnostic workflows.

SOA03-525-19 CAD4TB's precision, threshold 45 optimizes tuberculosis screening in West Nile region, Uganda

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Background: The Computerized Aided Detection for TB (CAD4TB), a component of TB screening using digital x-rays, uses a cut-off of 50 in Uganda to weigh between sensitivity and specificity for TB detection. The community awareness screening and testing (CAST+) for TB and other conditions' campaign 2024 experimented with lowering the CAD4TB threshold to 30 to maximize TB diagnosis. We evaluated CAD4TB version 7 (v7) in West Nile to identify an optimal cut off against the currently implemented values.
Design/Methods: Chest X-rays (CXRs) from 6,000 individuals (188 TB-positive, 4,690 TB-negative, confirmed by GeneXpert) were analyzed with CAD4TB v7. Receiver Operating Characteristic (ROC) analysis, including the area under the curve (AUC=0.97), assessed sensitivity, specificity, referral burden, number needed to test (NNT), and positivity yield at cut off 50 (national), 30 (CAST+), and other cut offs, including 45.
Results: The cut off 45 achieved a 96.81% sensitivity (95% CI: 93.1-98.9%) and a 94.22% specificity (95% CI: 93.5-94.9%), detecting 182 of 188 TB patients with 453 referrals. (NNT=2, yield=40%). Uganda's cut off 50 yielded 96.28% sensitivity (95% CI: 92.5-98.6%) and 98.02% specificity (95% CI: 97.6-98.4%), identifying 181 patients with 274 referrals (NNT=2, yield=66%). The sensitivity gains at 45 (+0.53%, p=0.045) detected one additional patient, with a specificity trade-off (-3.8%, p<0.001).
Compared to CAST's 30 (97.34% sensitivity, 70.3% specificity, 1,576 referrals, 12% yield), cut off 45 reduced referrals by 71% (1,123 fewer, p<0.001) while maintaining near-identical case finding (p=0.32).

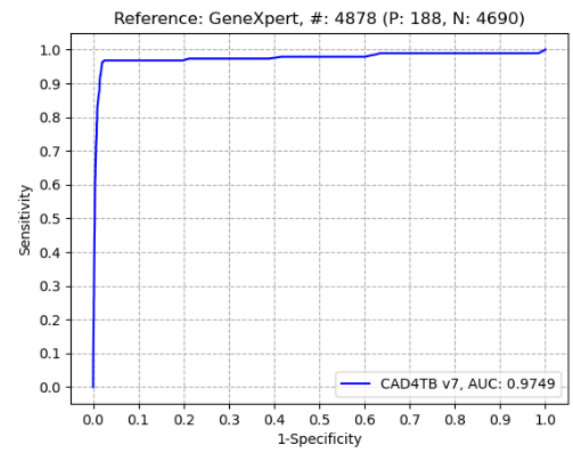

Figure. ROC curve and AUC computed from the obtained scores and provided reference.

Conclusions: In West Nile's region, cut off 45 optimizes CAD4TB screening, improving sensitivity over cut off 50. It reduces referrals and, improves case finding without compromising efficiency. We recommend use of context specific CAD4TB cut offs to optimize TB case finding and maximize efficiency.

SOA03-526-19 Impact of computer-aided X-ray diagnosis to optimise Xpert-orientated community-based active case-finding for tuberculosis: An open-label, randomised controlled trial

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Background: Almost one-third of individuals with new onset tuberculosis (TB) are unreported or undiagnosed. Thus, sensitive and user-friendly point-of-care (POC) screening tools are required to undertake community-based active case-finding (ACF) for TB.
Computer-aided detection (CAD) has been recommended by the WHO. However, the role of CAD and its impact, compared to alternative screening strategies, remains unclear.
Design/Methods: In this ongoing, open-labelled, randomised controlled trial (RCT), symptomatic and/or high-risk persons (HIV-positive, history of previous TB, diabetes, TB contact) were recruited from TB-endemic communities in South Africa, Zambia, and Zimbabwe.
Using a low-cost mobile vehicle staffed by three healthcare workers and equipped with an ultra-portable X-ray and GeneXpert® system, participants who questionnaire-screened positive (TB symptoms and/or risk factor present) were randomised (1:1) into either 'CAD+Xpert' (Arm 1: CAD followed by Xpert MTB/RIF Ultra in CAD-positive participants) or 'Xpert only' (Arm 2: POC Xpert MTB/RIF Ultra only).
CAD4TB version 7 was used with thresholds based on prior population-specific calibration. The primary outcome was the time-specific proportion of microbiologically confirmed TB by 60-days in each arm (Xpert Ultra and/or culture positivity). Here we present a preliminary interim analysis.
Results: From Feb 2022 to Sep 2024, 5,205 individuals were rapidly questionnaire-screened. 3,245 participants screened positive and were randomly assigned to CAD+Xpert (n=1,605) or Xpert only (n=1,640). 118/3,245 (3.6%) had microbiologically confirmed TB, of which 51/118 (43.2%) had asymptomatic TB. 105/118 (90.0) were included in the preliminary primary outcome analysis.
No difference was found in the proportion of TB detected by 60-days between arms (52/1,605 [3.2] vs 53/1,640 [3.2]).
Conclusions: Community-based ACF detected a high burden of TB. A CAD-directed Xpert strategy detected similar proportions of TB compared to universal Xpert testing. Feasibility and cost-effectiveness data are being analysed and will be presented along with the final results to demonstrate the full impact of a CAD-directed Xpert strategy.

SOA03-527-19 Large burden of asymptomatic tuberculosis detected with chest X-ray and computer-aided detection software

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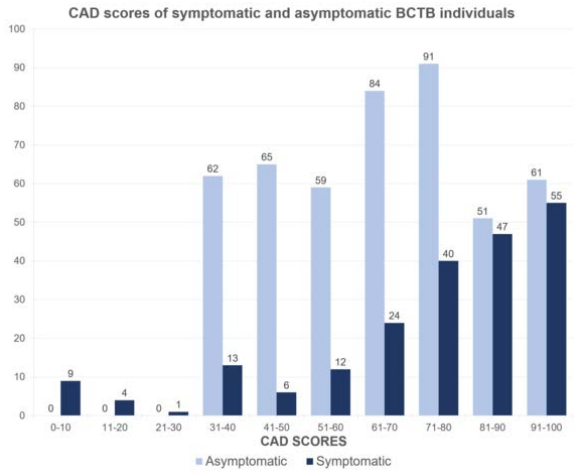
Background and challenges to implementation: The World Health Organization recently highlighted the burden of asymptomatic tuberculosis (TB) (persons with TB disease who report no TB symptoms during screening), and its possible role in transmission. In prevalence surveys, half of people with confirmed TB do not report symptoms. Tondo — a densely populated area in Manila, Philippines — has high TB transmission rates.
We present results of an active case finding (ACF) activity using digital chest X-ray with computer-aided detection (CAD) software, and this technology's ability to detect asymptomatic TB.
Intervention or response: Analysis of programmatic screening data from July 2023 to February 2025 of the general population ≥ 15 years using symptoms and chest x-ray (CXR) with CAD (CAD4TB v7, Delft) was performed. TB symptoms were defined as: cough > 2 weeks, fever, weight loss or night sweats.
People with symptoms or CAD scores > 32 irrespective of symptoms were considered presumptive TB and underwent sputum GeneXpert MTB/RIF (Xpert) testing. In-

cluded in this analysis were TB treatment-naïve individuals with bacteriologically confirmed TB (BCTB) defined by positive sputum Xpert results.

Results/Impact: The CAD scores and symptom screening results are shown in Figure 1. Among all people with BCTB, majority (69%, 473/684) reported no symptoms. Only 7% (14/211) of symptomatic participants had CAD scores below threshold.

Median CAD scores for symptomatic and asymptomatic people were 66.5 and 79.6 respectively. The difference between CAD scores of symptoms negative (M = 65.52, SD = 19.09) and positive (M = 72.97, SD = 23.94) individuals was statistically significant, t (682) = 4.35, $p < 0.0001$, 95% CI [-10.8177, -4.0823].



Conclusions: During ACF, most treatment-naive people with BCTB report no TB symptoms. Symptom screening may not be cost-effective when systematically screening with CXR and CAD. In high-risk populations, symptom-agnostic screening strategies with CXR and CAD are important to detect people with asymptomatic TB, who possibly drive community transmission.

SOA03-528-19 Intensified TB case finding and GeneXpert optimisation using chest X-rays with computer-aided detection (CAD) in Kenyan hospitals

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Background and challenges to implementation: Tuberculosis (TB) is a significant public health challenge in Kenya, with over 120,000 estimated TB cases in 2023; yet over 20% of TB cases were missed. Decreasing donor funding necessitates sustainable solutions for active case finding. By integrating Computer Aided Detection software (CAD) into existing x-ray equipment, the Kenya TB Program (NTP) aimed at finding the missed cases through screening of all chest x-rays for TB, allowing seamless expansion of TB screening within facility workflows, while mitigating against catastrophic patient costs.

Intervention or response: In May 2024, through Global Fund support, NTP deployed CAD software in X-ray units at 69 hospitals which was used to scan all chest X-rays taken irrespective of the initial purpose, and with no additional costs to patients. The TB diagnostic algorithm was revised to integrate CAD into the facilities' operational workflows and radiology professionals trained.

Patients with probable TB from CAD underwent molecular testing and those found to have TB were initiated on treatment while those with other diagnoses were referred for care. We analysed chest x-ray CAD data and GeneXpert data for the period May to December 2023 and 2024 from the 69 health facilities.

Results/Impact:

	May to December 2023	May to December 2024
Total X-rays read by CAD	No CAD available	35,592
X-rays with Probable TB from CAD	No CAD available	4,876
X-rays with Other Thoracic Abnormalities from CAD	No CAD available	14,842
Total GeneXpert Tests Done	81,521	131,639
MTB Positive Patients Diagnosed	10,060	15,155
% Increase in MTB Positive Patients Diagnosed	-	51%
GeneXpert Utilization (%)	52%	84%
GeneXpert Yield (%)	12%	12%

Table. Chest X-ray CAD and GeneXpert Data (May to December 2023, 2024) from 69 Health Facilities, Kenya.

Of the 35,592 X-rays read by CAD, 4,876 had probable TB while 14,842 were diagnosed with other thoracic abnormalities. Bacteriologically confirmed TB cases and GeneXpert utilization rates increased from 10,060 and 52% to 15,155 (51%) and 84% respectively between 2023 and 2024 for the same period. GeneXpert yield remained 12%.

Conclusions: Implementation of AI-enhanced surveillance of all chest X-rays CXRs within health facilities is a scalable and sustainable model for enhancing tuberculosis (TB) case detection in Kenya while simultaneously optimising limited TB laboratory investments. Optimizing use of this technology by reviewing the existing CAD thresholds has the potential to further improve GeneXpert testing prioritisation, and yields.

SOA03-529-19 Strengthening TB case detection in Uganda through mobile clinics and digital diagnostics: Lessons learned and future directions

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Background and challenges to implementation: The tuberculosis epidemic in Uganda is exacerbated by inaccessible diagnostic services in rural and remote regions with over 3,377 Diagnostic and treatment units (DTUs). Logistical barriers, limited resources, and underdeveloped healthcare infrastructure cause delays in TB diagnosis and treatment, increasing disease burden.

To address these challenges, Uganda implemented an innovative approach by integrating mobile clinics and digital diagnostics into its national TB response.

Intervention or response: Since July 2023 to December 2024, Uganda's National TB and Leprosy Program (NTLP), funded by the Global Fund, deployed five mobile clinics equipped with Xpert MTB/RIF and CAD4TB technologies.

These units were strategically located in underserved areas to improve access to TB services. The intervention featured community awareness campaigns, healthcare worker training, and collaboration with stakeholders to strengthen service delivery.

Monitoring and evaluation informed program improvements and scalability. Uganda plans to expand this initiative by procuring 11 additional clinics to cover all other 11 health regions.

Results/Impact: A total of 56,337 individuals were screened using Mobile TB Clinic equipped with Xpert MTB/RIF, digital X-ray and CAD4TB with 5,361 abnormal chest X-ray results documented. Additionally, 13,255 sputum samples were collected, and tested with GeneXpert, leading to the diagnosis of 1,072 TB patients, 58% (627) bacteriologically confirmed, including 11 RR-TB patients. 97% (1,038/ 1,072) of patients were initiated on same-day treatment. The decentralized mobile TB clinics at regional referral hospitals contributed 49% (525/1,072) of the total TB patients notified highlighting their effectiveness.

The use of Mobile digital technologies in TB Case Finding

Conclusions: Uganda's mobile clinics demonstrate the transformative power of integrating technology and community-centered approaches to overcome barriers in TB care. This scalable model supports Uganda's goal to end TB by 2030 and offers valuable insights for other low-resource countries aiming to enhance healthcare access and equity. Continued investment and collaboration are essential for sustainability.

SOA03-530-19 Reducing the tuberculosis case detection gap with AI: Advancing health equity in remote rural communities in Nigeria

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Background and challenges to implementation: Nigeria has one of the world's highest TB burdens, with a Case Detection Rate of 74% in 2023. Remote rural communities face major diagnostic barriers due to poverty, lack of chest X-ray and GeneXpert services at the primary care level, and limited transport to urban centers. These challenges delay diagnosis and widen health inequities. This study presents our experience implementing the INTEGRATE TB project, which deployed AI-enabled portable digital X-ray systems with WHO-endorsed CAD software (qXR) in three underserved LGAs of Ebonyi State.

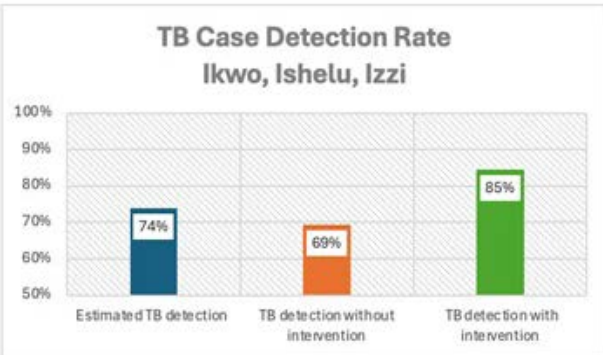
Intervention or response: Caritas Nigeria implemented the INTEGRATE TB project from July 2023 to December 2024, conducting community outreach in remote rural areas Ikwo,Izzi and Ishielu LGAs of Ebonyi state Nigeria. Screening followed a dual parallel approach: WHO symptom screening and AI-enabled chest X-ray (qXR). Individuals with symptoms or qXR AI scores ≥0.30 provided sputum for GeneXpert testing. Those with AI scores ≥0.30 but GeneXpert-negative were referred to radiologists for further clinical evaluation. Reported TB incidence from WHO (2023) served as the denominator to calculate the Case Detection Rate (CDR), with the CDR gap representing the additional cases identified through the intervention.

Results/Impact: The TB case detection rate computed without the intervention was 69%, five percentage points lower than the nationally reported in Nigeria, 74%.

With the intervention, the CDR reached 85%, a marked 11 percentage points increase with respect to the previous reported figure.

TB case detection rate in three Ebonyi LGAs: Ikwo, Ishelu and Izzi

	Case detection rate	TB cases
Estimated TB incidence	-	1,971
Estimated TB detection	74%	1,459
TB detection without intervention	69%	1,369
TB detection with intervention	85%	1,667



Comparator: Annual Incidence in Nigeria, 219 per 100,000 (WHO)

Conclusions: INTEGRATE TB project deployed the use of AI-enabled portable digital X-ray to provide a scalable, equity-driven solution to Nigeria's TB diagnostic challenges. Deploying AI tools at the community level offers a promising strategy to close the diagnostic gap, enhance early detection, and accelerate efforts toward TB elimination in high-burden, resource-limited settings.

SOA03-532-19 Accelerating TB screening and case finding through artificial intelligence retrofits into existing X-ray systems in Kenya

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Background and challenges to implementation: Artificial Intelligence (AI) has been deployed in active TB case finding through portable X-rays in remote settings, addressing the gap in trained radiology manpower. Hundreds of chest X-rays (CXRs) are taken for various clinical indications, yet facilities miss the opportunity to screen them for TB.

The Kenya TB program through Global Fund support retrofitted AI into facility-based X-ray systems, allowing for standardised, opportunistic TB screening without disrupting routine workflows. The integration experience and lessons will be useful for other countries considering this approach.

Intervention or response: A baseline facility assessment was conducted by a multidisciplinary team of engineers, TB program staff and radiologists on infrastructure readiness, internet availability, patient pathways, diagnostic services, and compatibility of AI software with existing X-ray modalities.

Thereafter, 69 sites (sub-county and County referral hospitals) were selected and a multimodal AI deployed between May and November 2024. An on-premise deployment model was used across all sites, requiring laptops with cloud synchronization capabilities.

AI-generated TB and lung health screening dashboards were availed for various stakeholders. All chest x-rays were reported using CAD.

Challenges	Mitigation
Lack of internet connectivity	• TB Program provided mobile Wi-Fi – MiFi • Additional data packs enabled to allow for non-TB screening
Limited lung health data available	• TB program set up a lung health program and developed health care worker resource tools to facilitate patient management and referral
Issues with data sync due to unstable internet	• Hospital ethernet was used
Lack of streamlined workflows at facilities	• Trained the health care workers on the AI solution using a standardised protocol. • Standard Operating Protocols and information posters put up in radiography rooms
Hardware challenges during set up	• AI provider ensured there were well trained and responsive in-country support partners to troubleshoot

Results/Impact: Seamless adoption of AI enabled screening of all 35,593 CXRs taken in these facilities for TB using existing infrastructure at no additional cost to patients and no increase in radiologist workload. Of these, 4,876 had probable TB. TB case finding in these sites increased by 51%.

Challenges identified during deployment included lack of or interrupted internet connectivity, weak patient referral for non-TB lung conditions, inefficient patient workflows and hardware challenges.

Conclusions: Kenya's experience demonstrates that a multimodal AI retrofit into existing X-ray infrastructure is feasible, has no cost implication to patients, enhances diagnostic accuracy and optimises radiologists' workload. Lessons learnt will enable other countries to rapidly adopt and scale up this facility-based approach to accelerate TB detection by ensuring no chest X-ray is missed for screening of TB.

SOA03-533-19 Enabling access to TB diagnosis and treatment through AI-enabled portable solution in Ukraine

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Background and challenges to implementation: The Chernihiv region of Ukraine had encountered significant medical service access disruptions due to its front-line proximity. The Regional Pulmonology Center (TB Center) sustained infrastructure damage, loss of medical equipment and vehicles, and faced healthcare personnel shortages, particularly radiologists. Number of visits to TB Center has declined due to difficulties in accessing healthcare facilities.

Confirmation of TB diagnosis, including X-ray interpretation, transportation and analysis of biological samples, was centralized and took up to 5 days, exceeding national TB care standards.

Intervention or response: Under the USAID-funded Support TB Control Efforts in Ukraine (STBCEU) project, PATH procured a mobile medical unit (MMU) equipped with Lunit INSIGHT CXR AI-enabled portable X-ray machine and telemedicine solution for the TB Center to provide decentralized case finding services.

In the fourth quarter of 2024, the project rolled out the MMU. STBCEU experts and local leadership collaboratively developed a tailored screening algorithm for remote settlements, enabling on-site X-ray analysis without the internet connection. This initiative included the immediate collection of biological samples from individuals with chest X-ray abnormalities indicative of TB and implementation of telemedicine solutions for TB treatment prescriptions.

Results/Impact: In the first quarter of 2025, the TB Center conducted seven visits to remote settlements based on prior risk groups identification, screened 951 individuals using Chest X-ray, revealed 39 abnormalities, with 9 individuals (23.1%) exhibiting TB-indicative findings on Lunit INSIGHT CXR. Sputum samples were collected from all 9 patients. TB was confirmed in 5 (12.8%) individuals: 3 began TB treatment within one day of confirmation, while 2 patients initiated treatment on day two after TB confirmation.

Results	Number of observations (n)	Distribution of abnormalities by type (%)
Total, screened by Lunit INSIGHT CXR	**951**	
Total, abnormalities	**39**	
Pulmonary, non-TB	**30**	**76.9%**
oncopathology	9	23.1%
pneumonia	21	53.8%
Findings suggestive of TB	**9**	**23.1%**
TB confirmed	5	12.8%
TB not confirmed	4	10.3%

Table 1. Abnormalities identified by Lunit INSIGHT CXR in Chernihiv Oblast, Ukraine.

Conclusions: The AI-enabled mobile approach reduced the average TB diagnosis time to approximately 1.5 days and facilitated prompt treatment initiation through teleconsultation in regions where healthcare access and public transportation was limited.

SOA04 Innovative programmatic approaches to eliminate TB

SOA04-534-19 Enhancement of village midwife contribution to increase coverage of TB preventive treatment (TPT) in 3 selected districts in Sumatera Utara Province, Indonesia

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Background and challenges to implementation: In three districts (Dairi, Tapanuli Utara, Toba Samosir), there have been no cases of individuals initiated on TB preventive treatment (TPT) or contact individuals tested for infection over a period of two consecutive years. To address this gap, village midwives, who are government health workers for maternal health stationed in local villages, have been involved in contact investigation and sputum collection procedures.
Intervention or response: With funding from the STOP TB Partnership, TB workers at puskesmas (community health center) were involved and trained to improve their skills in planning, organizing, recording, and reporting TB contact investigation and TPT. TB workers then train Midwives on TPT, methods to educate the community, screen and link to puskesmas for testing and treatment. Village midwives visited TB index patients, screened their contacts for TB, and collected sputum from those with symptoms. They also tested those without symptoms and over five years of age for TB Infection (TBI).

Indicators	Project targets	Project Achievement				% of target achieved
		Child 0-4	Child 5-14	Adult	Summary	
Number of people screened	4.725	602	3.055	9.362	13.019	275%
Number of people tested for infection	2.561	0	1.765	5.113	6.878	268%
Number of people who test positive for infection	512	0	233	913	1.146	224%
Number of people with TB disease (ineligible for TPT because of active TB or for other reasons)	19	6	15	66	87	456%
Number of people eligible for TPT	737	166	233	913	1.312	178%
Number of people started on TPT	516	34	162	649	845	164%
Number of people completing TPT	490	24	89	403	516	105%

Results/Impact: A total of 159 TB workers from 58 puskesmas (community health centers) were trained and they continuously trained 917 midwives. Over the course of a year, 13,019 contacts were screened. Of these contacts, 6,878 (53%) were tested for TBI and 1,146 (17%) were positive Tuberculin Skin Test (TST). The total number of eligible for TPT was 1,312 (19%) and 845 (64%) of these contacts initiated TPT. The primary factor contributing to the low initiation rate was the limited availability of treatment.
Conclusions: Involvement of midwives in the initiation of TPT has been demonstrated to yield a substantial increase in number of individuals who started TPT. It increased TBI screening and testing, recording and reporting in national system and subsequently assist those eligible to initiate TPT until completion. The potential for increasing the number of initiations is significant, contingent upon the timely distribution of logistics by government.

SOA04-535-19 The positive impact of using riders for health in TB specimen transportation compared to health workers in Ogun State

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Background and challenges to implementation: Timely and efficient transportation of sputum samples for tuberculosis (TB) diagnosis is essential for early detection and prompt treatment initiation. In high-burden settings, healthcare workers are often tasked with transporting TB specimens. This dual responsibility contributes to delays due to competing clinical duties, transportation limitations, and workforce shortages. Riders for Health (RFH)—a specialized logistics system using trained motorcycle riders—offers a promising solution to improve TB diagnostic efficiency. This study evaluates the impact of RFH compared to healthcare worker-led specimen transport on turnaround time, sample integrity, and treatment initiation.
Intervention or response: A comparative analysis was conducted across high TB-burden districts where RFH was implemented. Data sources included laboratory records, patient registers, and interviews with healthcare providers. Key indicators included sample transit time, percentage of samples delivered to laboratories within 24 hours, diagnostic turnaround time, and treatment initiation rates. Operational challenges and cost-effectiveness were also assessed.
Results/Impact: RFH reduced sample transit time by 47%, with 89% of specimens delivered within 24 hours, compared to 50% under the healthcare worker-led system. Diagnostic turnaround time improved by an average of 2 days, enabling earlier case detection. Treatment initiation increased by 35% as individuals received results more quickly. Better sample handling and reduced con-

tamination under RFH improved specimen integrity. Relieved of transport duties, healthcare workers dedicated more time to person-centred care. While RFH involved higher initial investment, long-term efficiencies and improved outcomes supported its sustainability.
Conclusions: Riders for Health enhances TB diagnostic services by ensuring timely specimen transport, preserving sample integrity, and allowing healthcare providers to focus on patient care. Scaling up this approach in high-burden and remote areas, alongside digital tracking and cost optimization, can further strengthen TB control efforts.

SOA04-536-19 Overview of cross-border TB management in West and Central Africa

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Background: Migrants and refugees are at greater risk of TB exposure due factors such as overcrowded living and working conditions and increased vulnerability to HIV. TB treatment remains a challenge among migrant populations due to frequent movement and lack of coordinated cross-border systems. We sought to understand systems for cross- border management of TB in West and Central Africa.
Design/Methods: A cross-sectional, multi-country study was conducted in February to December 2024 to understand the existing collaborative mechanisms for cross-border TB management and the impact of cross-border patient flows on programmatic TB management. A semi-structured survey was administered by the secretariat of the WARN/CARN TB, a regional network of 27 NTPs in West and Central Africa, among NTP heads.
Results: Responses were received from 23 countries (82%), with 18 (78%) reportingcross-border flows of TB patients. A total of 15 countries reported outgoing patient flow, and 17 reported incoming patient flow. No countries reporting formal mechanisms for recording cross-border management of TB patients; consequently, the migratory flows of TB could not be quantified. No country had cross-border referral-counter-referral system for TB patients and only 1 country had the contacts for TB clinics in border areas in neighboring countries. 13 (86%) of countries of origin reported not knowing whether their patients were continuing their treatment abroad. Only 4 countries (22%) reported collaborations with international partners on managing cross-border populations, and 5 (28%) reported collaboration between neighboring countries. The most affected components of TB programming were patient follow-up, followed by TB data collection, supply of drugs and diagnostic products, and TB diagnosis.
Conclusions: Cross-border TB management remains a major challenge for NTPs, with limited systems available to mitigate this impact and manage patients across different countries. There is an urgent need to put in place appropriate mechanisms for collaboration between countries and with partners.

SOA04-537-19 Evaluation of a low-cost digital courier monitoring system using Kobo Collect, R, and Shiny to strengthen specimen referral performance in Zambia

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Background and challenges to implementation: In Zambia, inefficiencies in specimen referral systems—such as delayed dispatches, missed transports, and lack of visibility—have hindered timely diagnosis and surveillance for TB and other priority conditions. Despite routine courier activities, key indicators were not systematically tracked due to the absence of a standardized reporting format, limiting accountability and data use. These gaps, particularly at the facility–hub interface, highlighted the need for a scalable, low-cost digital system.
This evaluation assessed the implementation and early performance of a courier monitoring system built on Kobo Collect, R, and Shiny.
Intervention or response: From December 2024 a digital tool has deployed using Kobo Collect for mobile data capture and R with Shiny for automated analytics and dashboard visualization. It collects structured weekly data from spokes, hubs, testing, and reference laboratories on dispatches, turnaround times, missed trips, transport availability, and supervision. Dashboards were generated in real time and accessed by district, provincial, and national program teams.
The system is implemented entirely on open-source platforms, allowing unlimited customization. District Sample Referral Focal Point Persons (DSR-FPPs) were trained to supervise reporting and use the dashboard for targeted follow-up.
Results/Impact: From December 2024 to March 2025, 235,828 samples were reported from spoke facilities, with submission rates increasing from 13.4% to 19.8%. Concurrently, hub-level data showed 1,025,479 samples recorded over the same period, with peak volumes in January 2025 (459,173).

The consistent rise in reporting reflects increased engagement by facility and hub staff. The dashboard now enables real-time tracking across courier tiers, improving supervision, resource allocation, and accountability.
Conclusions: This evaluation demonstrates the potential of low-cost, open-source tools to strengthen diagnostic logistics. The system's adaptability, rising usage, and integration into supervision workflows make it a scalable model for improving health system performance and public health responsiveness.

SOA04-538-19 QR code efficiency: Transforming specimen management in laboratories

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Background and challenges to implementation: Reliance on manual processes for monitoring quality of diagnosis led to errors, and delays in obtaining test results. To address the challenges in tracking the journey of specimen transport from collection to testing sites, a QR Code-based system was introduced into Ni-KSHAY.
This innovation encodes crucial information, including Patient & Sample ID, Sample Type (e.g., sputum, blood), Timestamp of Collection, Collection Location, and Laboratory Details.
Intervention or response: Under the PPSA project, HLFPPT has trained community health workers involved in the initiative on SCT mechanism utilizing QR codes. During sputum collection, the agent affixes a QR code to the falcon tube, linking it with the respective Ni-KSHAY ID of the individual, and transports it to the nearest laboratory. At the testing facility, the lab technician scans QR code, logs into the system, and updates the results upon completion of testing. This process ensures seamless transparency in the specimen's journey.
The study analyzed 5,331 QR-coded samples transported in Lucknow, selected from over 15,000 samples in Uttar Pradesh and extracted data from program records, laboratory reports, and Nikshay, the national TB database. The study facilitated an in-depth examination of logistical efficiency, diagnostic timelines, and outcomes, providing valuable insights into TB specimen tracking.
Results/Impact: The study findings reveal that the average time taken from sample collection to test result generation for QR-coded samples is 1 day. It marks a significant improvement compared to samples without QR codes, showcasing the streamlined processing and rapid diagnostics enabled by QR-coded systems.

TAT - Sample collection to Test result	Number of samples (N = 5331)	Percent
Within 2 days	3724	70%
3 to 4 days	1108	21%
> 4 days	499	9%

Table. Proportion of samples - TAT for NAAT grouping.

Conclusions: The integration of QR Codes into Ni-KSHAY represents a significant leap towards improving TB specimen transport tracking systems. The implementation of QR Codes has enhanced specimen transport pathways by:
1. Enabling accurate tracking and real-time monitoring of specimens.
2. Ensuring accurate linkage of test results to original specimens.
3. Facilitating Turnaround Time (TAT) analysis to enhance operational efficiency.

SOA04-539-19 Following tuberculosis testing: Safe disposal of molecular testing waste in Kenya

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Background and challenges to implementation: Molecular rapid diagnostics like Xpert MTB/RIF, Truenat, TB-LAMP, LF-LAM, and Virology Xpert for HIV support timely detection of TB and HIV. However, some contain Guanidinium Isothiocyanate (GITC), that if improperly disposed produce hydrogen cyanide, posing serious risks to health and the environment.
To address this, 19 Counties in Kenya were supported to enhance hazardous waste management through infrastructure upgrades, incinerator servicing and waste referral systems.
Intervention or response: Between 2019–2020, Amref Health Africa, Ministry of Health and CDC-Kenya, assessed molecular laboratory waste management practices across the country. Sixty-eight incinerators were mapped, revealing functional limitations and infrastructural gaps. Between 2023–2024, the Global Fund supported improvement of 19 key incinerators (each per county), ensuring they reached over 1000°C for safe destruction of GITC as recommended by World Health Organization (WHO). A waste referral network was also established, with 79 riders trained and stationed in 79 facilities gener-

ating molecular waste. They were tasked to transport the waste to designated disposal sites. High-workload facilities received weekly transport, while others were served on need basis.

Results/Impact: Of the 68 incinerators assessed, 45 were sub optimally functional. Of the 45, nineteen (one per county) were upgraded at average cost of USD 9,302.33 each, achieving >1000°C with 2-second retention time. Seventy-nine high-volume facilities generating molecular waste were each assigned a trained rider for safe transportation, at a cost of USD 0.62 per kilometer.

During implementation period, 2,052 kg of hazardous molecular waste was safely transported to the incinerator site for incineration.

Conclusions: Upgrading incinerators to achieve high temperatures >1000°C with proper retention time and establishing a functional waste referral system enabled safe disposal of over 2,000 kg of hazardous molecular waste in 19 counties. This approach proves effective and scalable, with potential for broader adoption to strengthen diagnostic waste management across Kenya.

SOA04-540-19 Enhancing sample transportation under National TB Elimination Programme through a cost-effective multisectoral accountability model

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Background and challenges to implementation: In Kerala, India, strengthening the TB diagnostic network requires advanced lab infrastructure and a reliable sample transport system. Despite well-equipped labs, the lack of an end-to-end transport mechanism aligned with National TB Elimination Programme (NTEP) norms hindered service quality.

To address this, the State TB Office (STO) launched a collaborative initiative to establish a streamlined, cost-neutral network linking peripheral health centers with central labs for timely diagnosis.

Intervention or response: The STO held extensive consultations with potential agencies before partnering with India Post, the world's largest public sector postal network. In a show of commitment to TB elimination, India Post agreed to waive pickup fees, significantly reducing overall costs.

Subsequent stakeholder meetings culminated in the signing of a Memorandum of Understanding (MoU) with India Post to guarantee sample delivery from any location in the state to designated laboratories within 24 hours, as mandated by NTEP. Comprehensive mapping was undertaken to link all healthcare institutions and TB laboratories to their nearest post offices. Concurrently, extensive training was provided to the personnel of both the STO and India Post on MoU implementation and quality assurance protocols. A joint monitoring and feedback system was also established.

To ensure sustainability, partnerships with corporates, Non-Government Organizations, and private banks supported high-quality packaging, sample transportation cost, and expanded diagnostic capacity—enabling uninterrupted case-finding without placing additional financial burden on the health system.

Results/Impact: Post-implementation analysis of laboratory indicators shows substantial improvements which are summarized in Table 1.

Sl. No	Indicators	Before the implementation of new sample transportation system	After the implementation of new sample transportation system
1.	Proportion of samples offered molecular WHO-recommended rapid diagnostic tests (mWRD) as the first test	49%	76%
2.	Proportion of microbiologically confirmed pulmonary TB patients with valid test result for Rifampicin resistance	88%	94%
3.	Proportion of microbiologically confirmed extrapulmonary TB patients with valid test result for Rifampicin resistance	85%	86%
4.	Proportion of microbiologically confirmed pulmonary TB patients with valid test result for Isoniazid resistance	66%	73%
5.	Proportion of microbiologically confirmed extrapulmonary TB patients with valid test result for Isoniazid resistance	29%	31%
6.	Average number of days from date of diagnosis to date of valid test result for Rifampicin resistance	16	1
7.	Average number of days from date of diagnosis to date of valid test result for Isoniazid resistance	29	12

Table 1: Key indicators of TB laboratory services before and after the implementation of sample transportation system through India Post.

Conclusions: This innovative model—anchored by collaboration between two government entities—shows how public-sector synergy, accountability, and strategic resource mobilization can deliver scalable impact. It enhances access to universal Drug Susceptibility Testing, early treatment initiation, and interruption of TB transmission. Its success and user-friendliness position it as a strong candidate for adaptation as a multi-disease sample transport system across health programs.

SOA04-541-19 Leveraging digital technologies to reduce service downtime and improve turnaround time of results from GeneXpert testing facilities in Southwest Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Nigeria, made worse by delays in diagnosis, equipment downtime, and inefficiencies in laboratory operations. These issues are linked to poor infrastructure, inconsistent power supply, limited technical capacity, and slow specimen transport and result delivery. These factors contribute to missed diagnoses, prolonged transmission, and poor treatment outcomes.
To address this, the TB LON-3 project introduced digital solutions to strengthen the performance of GeneXpert testing facilities in Southwest Nigeria.
Intervention or response: In 2022, the project deployed a digital dashboard for weekly monitoring of 150 rapid molecular diagnostic machines, including 85 GeneXpert, 55 TB LAMP, and 11 Truenat platforms. The dashboard tracked performance indicators such as sample volumes, error rates, equipment functionality, and turnaround time (TAT). Real-time insights allowed for quick identification of underperforming laboratories. Daily and weekly performance reviews enabled timely corrective actions to resolve issues related to power, equipment faults, reagent stockouts, and staffing gaps.
Results/Impact: This approach led to a reduction in GeneXpert equipment's downtime and improved modular functionality and service efficiency. Since its implementation in 2022, modular functionality has increased from 73% to 98%, while turnaround time for TB test results dropped from more than 120 hours to 24-48 hours. Using an approved benchmark of 20 samples per functional module per week, the average weekly equipment utilization rates across the four implementing states have increased, from 84% to 126% and overall weekly project evaluation rates improved from 69% to 96%, enhancing diagnostic efficiency and service delivery.
Conclusions: Integrating digital laboratory monitoring tools significantly reduced downtime, improved result turnaround time, and enhanced resource use across testing sites.
This experience highlights the power of digital innovation in improving TB diagnostics and enabling data-driven decisions. Scaling this strategy across more facilities could further strengthen Nigeria's TB diagnostic system and support national efforts to eliminate TB.

SOA04-542-19 A comparative analysis of novel latent tuberculosis infection screening tests to drive economic gains in TB Preventive Ttherapy (TPT) program in Zambia

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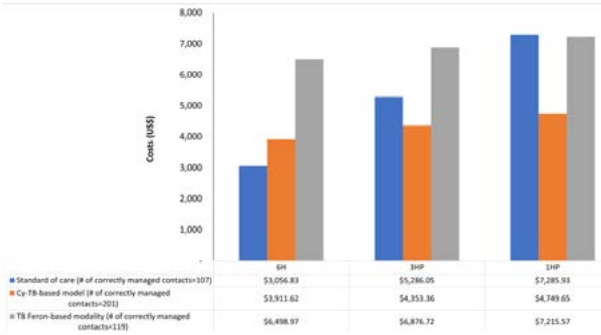
Background: Zambia is among the 30 high tuberculosis burden countries, with an incidence rate of 319 per 100,000. TPT uptake is currently low, except in PLHIV, and needs to be efficiently scaled up. We measured the cost and cost-effectiveness of adding Cy-Tb™ skin test and STANDARD™ F TB-Feron FIA (IFN-gamma) test, to the current standard of care, no TBI testing, for the TPT program in Zambia.
Design/Methods: A prospective economic evaluation was nested in a three-arm cluster-randomised trial comparing Cy-TB and TB-Feron to standard of care. Cost data were collected from the provider's perspective using the Time-Driven Activity-Based Costing method. We used the global drug facility cost for Cy-TB and TPT drugs and a plausible range of cost for TB Feron. We modeled costing using a cohort of 324 TB contacts to calculate the cost of TPT initiation for the different scenarios to assess the affordability and value-for-money of introducing TBI testing into the TPT program.
Results: TB screening and TPT initiation cost US$1.87 and US$0.78, respectively. Cy-TB testing costs US$3.70 and TB Feron testing cost was estimated as $5-$15.90. Figure 1 presents estimated total costs of TPT by regimen. The cost per person initiated on TPT were US$10.69, US$18.48 and US$25.48 for 6H, 3HP and 1HP in the SOC arm, US$44.37, US$53.57 and US$61.83in the Cy-TB arm, and US$83.86, US$91.57, and US$98.49 in the TB Feron arm. Programmatically adding Cy-TB testing

saved US$1,321.88 and US$2,710.81 for the 3HP and 1HP regimens, respectively. TB Feron was only cost-saving (US$1,376.39) for the 1HP regimen.



Conclusions: While TBI testing increases the cost per individual receiving TPT, introducing Cy-TB would be cost-saving if 3HP or 1HP regimens are used in Zambia, due to more efficient targeting of TPT offsetting the additional costs. TB Feron would only be cost-saving for the 1HP regimen.

SOA04-543-19 Assessing the acceptance and effectiveness of a digital adherence technology for TB preventive treatment in Bangladesh

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Background: Traditional directly observed therapy (DOT) has been criticized for compromising patient autonomy, privacy and dignity. Citro et al. (2022) advocate for rights-based, patient-centered approaches that move beyond coercive models of care. In response, iDOTS, a locally developed digital adherence tool was introduced to empower patients through remote, non-intrusive monitoring of tuberculosis preventive treatment (TPT) adherence. This study assessed acceptance and effectiveness of iDOTS among TPT eligible individuals.
Design/Methods: A mixed-methods observational study was conducted across two districts (intervention and control sites) in Bangladesh. Pre- and post-intervention assessments included 461 patients and 77 healthcare providers, guided by the "UTAUT" theory. TPT adherence was measured using self-reports, iDOTS dashboard and urine IsoScreen testing. Qualitative data were analyzed thematically to explain quantitative results. Statistical analyses involved descriptive statistics, inferential tests and regression modeling.
Results: Among iDOTS users, 95% completed TPT against 40% in control group. IsoScreen testing confirmed adherence in 79% of intervention group versus 17% of controls.
Over 97% of participants reported iDOTS helped build medication habits and served as effective reminders. High mobile phone ownership (96%) and network availability (95%) enabled its use, although 23% cited insufficient phone recharge as a barrier.
Male participants showed significantly higher acceptance than females across usability and belief measures: 84.3% of males had enough recharge (vs. 63.5% of females, $p<0.001$), 89.5% found it user-friendly (vs. 76.6%, $p=0.006$), and 89.5% found it easy to learn (vs. 80.0%, $p=0.013$).
Additionally, 82.2% of males vs. 58% of females ($p<0.001$) and 100% participants with advanced education ($p=0.028$) believed iDOTS would prevent future infections if they complete treatment.
Conclusions: iDOTS demonstrated strong effectiveness and acceptability, aligning with human rights-based TB care by enhancing patient autonomy, privacy and dignity. However, sex disparities and limited phone recharge remained barriers. Sex-sensitive engagement strategies and recharge support should be incorporated to promote equitable and sustained TPT adherence.

SOA04-544-19 Estimating healthcare worker time for tuberculosis preventive treatment activities in high TB-HIV burden countries in sub-Saharan Africa

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Background: Tuberculosis (TB) is major public health issue in sub-Saharan Africa, where TB-HIV co-infection rates are high. Tuberculosis Preventive Treatment (TPT) is vital for reducing TB, yet data essential for resource planning and evaluation such as healthcare worker (HCW) costs associated with TPT implementation are scarce in the African setting. This study aims to estimate HCW time for delivering TPT services using data from Lesotho and Eswatini.
Design/Methods: Three tools assessed HCW time spent on TPT provision with either 6 months of isoniazid and 3 months of isoniazid and rifapentine: the time and mo-

tion (TAM) tool (direct observation), the time estimation questionnaire (TEQ), and self-reported time sheets (TS). Salary data were converted to per-minute rates, with costs calculated based on the range of time spent, adjusted to 2023 USD.

Results: Data from nine HCW cadres in Eswatini and Lesotho, encompassing 218 activity records, showed that overall, HCW time for TPT delivery ranged from 27 to 58 minutes, resulting in HR costs between $5 and $10.

When this is broken down by activity, triage ranged from 2 to 7 minutes, with associated HR costs between $0.10 and $0.40, the time required for consultations to initiate TPT ranged from 9 to 11 minutes, resulting in HR costs between $1.90 and $2.90.

Monthly compliance monitoring for TPT ranged from 7 to 8 minutes, with HR costs from $1.40 to $1.90. Treatment literacy activities ranged from 8 to 10 minutes, with HR costs between $1.10 and $1.30. The time for dispensing TPT ranged from 1 to 3 minutes, with HR costs from $0.15 to $0.30.

Activity	Median Time (Minutes)	Cost ($)
Triage	2-7	0.12 – 0.4
Consultation to initiate TPT	9-11	1.97 – 2.9
TPT Dispensing	1-3	0.15 – 0.3
Monthly compliance/AE monitoring of TPT	7-8	1.4 - 1.9
Treatment Literacy for TPT	8-10	1.1 – 1.3
Consultation on TB Diagnosis	15-17	3.6 – 3.8
ATB Treatment Drug Dispensing	1-3	0.15 - 0.3
Monthly compliance/AE monitoring of ATB	8	1.4-2.0
Treatment Literacy for ATB	5 - 35	0.8 - 2.3

Table: HCW time and cost.

Conclusions: This study provides valuable data on required resources to scale up TPT services including HCW time and cost to inform and support planning and resource allocation, staff workload optimization, and efficient TPT program implementation in sub-Saharan African settings.

SOA04-545-19 Acceptability of home-based TB prevention services by community health workers in the CHIP-TB trial

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Background: Ethiopia's health-care system is underpinned by community health workers (CHWs), who deliver community-based preventative services. The CHIP-TB trial assessed whether a home-based task-shared intervention could improve the uptake of tuberculosis preventive treatment (TPT) in exposed children < 15 years of age compared with facility-based standards. Post-trial, we qualitatively explored interest-holders' perceptions of the acceptability, feasibility and sustainability of home-based contact management and TPT delivery by CHWs.

Design/Methods: In-depth qualitative interviews were conducted with 47 key interest-holders including 15 adult caregivers of TB-exposed children, 15 CHWs, 9 TB providers, and 8 TB-program managers. Interviews were conducted in East Shewa Zone of Oromia, Ethiopia from October 2022 to March 2023. A semi-structured interview guide sought feedback on the intervention and suggestions for improvement and sustainability. Interviews were coded independently and analyzed by two researchers using thematic analysis.

Results: Four themes were extracted from the data; first, the impact of the intervention on TPT adherence. The home-based intervention delivered by CHWs bolstered the perceived value of TPT through individualized treatment schedules and accommodating family-preferences, thus increasing adherence. Second, although challenges to CHW-initiated TPT were identified including concerns around CHW safety while traveling, other concerns such as TPT stigma, CHW skill, and lack of community buy-in, were not reported to hinder implementation or acceptability of the intervention. Third, CHW commitment to community strengthened the intervention. CHWs were committed to TPT access; their dedication helped to overcome structural barriers such as lack of transportation to deliver home-based services. Finally, CHWs preferred individualized supervision and support for the intervention. Some CHWs requested hands-on field training and supervision for real-time feedback to support the intervention's impact during scale-up.

Conclusions: Overall, TPT delivered in a task-shared model was acceptable and CHWs overcame potential challenges to home-based care that supported TPT access and family-centered care.

SOA05 Surveillance in the digital age

SOA05-546-19 The impact of early warning outbreak recognition system (EWORS) on improving tuberculosis case finding in Katsina, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a leading cause of morbidity and mortality in high-burden regions, where delayed case detection undermines control efforts. Traditional case-finding strategies often lack precision, missing emerging transmission clusters. In Nigeria's North West, the absence of real-time data systems has hindered early intervention in TB hotspots.
This study evaluates the impact of integrating the Early Warning Outbreak Recognition System (EWORS)—a digital surveillance platform—into TB control activities to enhance case detection in high-transmission zones.
Intervention or response: From January to June 2024, a phased intervention was implemented across selected Local Government Areas (LGAs). In Quarter 1 (Q1), TB case-finding relied on routine facility-based methods. In Quarter 2 (Q2), EWORS was deployed to analyze syndromic and geo-spatial data to identify potential TB outbreak hotspots. Outreach teams used EWORS-generated alerts to direct mobile screening, sputum collection, and diagnostic testing in flagged areas. All data were documented using harmonized digital tools linked to national TB surveillance platforms.
Results/Impact: Following EWORS implementation, TB case notifications increased from 1,548 in Q1 to 2,312 in Q2—a 49.3% rise. Of these, 1,404 cases (60.7%) were directly linked to EWORS-guided outreach. Importantly, bacteriologically confirmed TB rose by 55%, and detection of TB among children under 15 doubled. The intervention also reduced the average time from symptom onset to diagnosis by 40%. These findings underscore EWORS' effectiveness in enhancing precision screening, improving early diagnosis, and maximizing resource use.
Conclusions: The integration of EWORS into TB surveillance significantly improved case detection and reduced diagnostic delays in a high-burden setting. By enabling real-time identification of transmission hotspots and guiding targeted outreach, EWORS offers a scalable, data-driven solution for strengthening TB control. Its adoption should be prioritized in national TB strategies for high-incidence regions.

SOA05-547-19 Geospatial analysis and optimization of tuberculosis diagnostic network coverage in Zambia

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health threat in Zambia, with limited access to quality diagnostic services hindering timely case detection and treatment. Zambia has made progress replacing microscopy with GeneXpert testing since 2017. However, case detection remains below 70% of estimated incidence, suggesting a substantial untested population.
The aim of this study was to evaluate the current GeneXpert instrument availability and efficiency of use in Zambia and determine gaps through geospatial mapping.
Intervention or response: The analysis employed ArcGIS for geospatial mapping and FICO Xpress Optimization to evaluate service accessibility. A master health facility database was integrated with GeneXpert inventory, testing statistics, smear microscopy data, and geographic coordinates of 1,607 health facilities. Population density maps and road network data were incorporated to assess spatial accessibility of services.
Facilities were classified as baseline (existing GeneXpert sites), candidate, or other. Spatial optimization models were developed to select candidate facilities that would maximize population coverage and demand.
Results/Impact: Geospatial mapping revealed that 66% of the 255 baseline GeneXpert facilities, were underutilized. That 75% of Zambia's population lives within 35 km of GeneXpert services (82% within 50 km), with high coverage in urban and low coverage in rural area.
Heat maps of accessibility demonstrated that population coverage could be increased to 86% by improving sample referral and to 90% by adding GeneXpert machines at spatially optimized candidate facilities. Five spatial optimization scenarios illustrated incremental coverage improvements based on service area distances from 5 km to 50 km.
Conclusions: Geospatial analysis showed there is good GeneXpert coverage in urban areas but gaps remain in rural areas. Improving specimen referral networks to existing GeneXpert facilities and placement of new machines in underserved areas could be impactful.
The results highlight the need for follow up geospatial analysis every two years to keep track of changes in diagnostic network.

SOA05-548-19 Leveraging AI for targeted TB/HIV control: Insights from the EPCON pilot in Katsina State, Nigeria

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Background and challenges to implementation: In Katsina State, Nigeria, identifying TB and HIV among pregnant women, other high-risk individuals and treating them remain a major public health challenge. Many of this high-risk group are missed due to limited data visibility, poor access to health services, and the inability to accurately target interventions. Traditional screening approaches often fail to identify hotspots or underserved populations where the disease burden is highest and treatment access is lowest. Addressing these challenges, KNCV Nigeria funded by the Global Fund, implemented the EPCON pilot study, identifying high-risk communities and populations for TB and HIV using the AI-powered epidemiological tool.
Intervention or response: EPCON was adapted to target communities where pregnant women and other high-risk individuals that are likely not accessing TB/HIV services. Guided by AI predictions, screening and outreach activities were implemented in identified hotspots. Data from these activities were gathered and analyzed to evaluate the effectiveness of the intervention.
Results/Impact: Through Epcon 78 TB cases in pregnant women was diagnosed which was 3.6% of the total TB cases identified within the study period. Prior to the introduction of Epcon, TB cases among pregnant women were not systematically tracked, indicating a significant gap in surveillance.
Similarly, Epcon facilitated the screening of pregnant women for HIV, resulting in the detection of 87 HIV-positive pregnant women. Among these, 15 (17.2%) were found to be co-infected with TB, highlighting the burden of TB/HIV co-infection in this vulnerable population.
Conclusions: The EPCON pilot shows that AI can play a vital role in transforming complex health data into actionable insights. By supporting smarter, faster, and more targeted public health responses, AI-powered tools offer a promising future for TB/HIV control efforts and broader

disease surveillance. Scaling this approach can enhance efficient deployment of health resources, improving coordination between facility and community services.

SOA05-549-19 Next-gen TB analytics in Nigeria: AI-enhanced DHIS2 integration for smarter predictions and reporting (EPCON AI in Focus)

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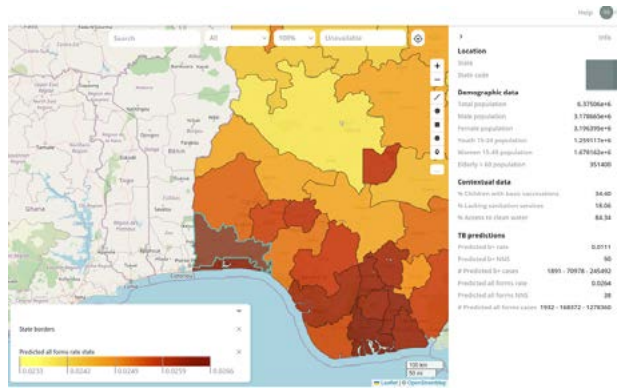
Background and challenges to implementation: District Health Information System 2 (DHIS2) is widely used for health data management, it lacks predictive analytics and geospatial visualization capabilities. Integrating Artificial Intelligence (AI) with DHIS2 through the EPCON Geoportal and Dashboard platform enhance TB surveillance by enabling predictive geo-mapping and improving the reporting system for more effective decision-making.
Intervention or response: This study employs AI-driven machine learning models to analyse historical TB data from DHIS2 system used by TB-LON3 project in Nigeria, generating predictive insights and spatial distributions of TB cases. The EPCON Geoportal facilitates geospatial analysis, real-time mapping, and automated reporting, ensuring seamless integration with DHIS2. The effectiveness of AI-enhanced predictive geo-mapping was compared with traditional epidemiological models, while the impact on reporting efficiency was assessed.
Results/Impact: The AI-powered system significantly improved TB case prediction accuracy and enabled real-time identification of high-risk areas through geospatial analytics with hotspot mapping giving the exact location. The integration of EPCON with DHIS2 streamlined TB data reporting using its dashboard views to present analyses through different queries, reducing errors and improving response time.
Interactive dashboards and notification system make data accessibility for health officials, facilitating timely interventions and resource allocation. The integration of AI-driven predictive geo-mapping with DHIS2 via the EPCON Geoportal and Dashboard platform in TB-LON3 program has transformed TB surveillance in Nigeria. By providing real-time spatial analytics and improved reporting, which enhanced disease monitoring, supports targeted interventions, and strengthens TB control strategies for the program.



Conclusions: AI-powered predictive analytics and geospatial visualization have significantly improved TB surveillance and reporting in Nigeria. The successful integration of AI with DHIS2 through EPCON demonstrates the feasibility of leveraging advanced technology for disease control. Expanding this approach to other infectious diseases will further enhance Nigeria's healthcare data ecosystem.

SOA05-550-19 Impact of scaling-up an automated monitoring system, TB-Watch, on programmatic performance for TB elimination in Uttar Pradesh, India

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Background and challenges to implementation: India is committed to achieve the Tuberculosis (TB) related Sustainable Development Goals (SDGs) through its comprehensive efforts under the National TB Elimination Programme (NTEP). The World Health Organization, in its End TB strategy underscores the importance of robust monitoring in TB elimination efforts which is also integrated in the country's National Strategic Plan.

Hence, this research assessed the impact of scaling up an automated monitoring system called TB-Watch in all the 75 districts of Uttar Pradesh based on NTEP.

Intervention or response: TB-Watch processes data from Ni-kshay, India's case-based digital TB surveillance system, and provides weekly offline NTEP indicator updates for uniform performance monitoring at district and tuberculosis unit levels. Stratified randomized parallel arm study design was used to pilot TB-Watch after which the Government of the State of Uttar Pradesh decided to scale this up for all 75 districts of the state in August 2024. TB-Watch scale-up was operationalized through the dedicated systems identified by the Government of Uttar Pradesh. Comparative analysis was done using the Z-test for proportions.

Results/Impact: TB Score, which is a composite measure of TB program performance, increased by 40% from August 2024 to December 2024 following the TB-Watch scale-up. This increase was significantly higher compared previous year before the scale-up ($p<0.001$). Subcomponents of TB Score showed notable improvements: TB Prevention Treatment in household contacts rose by 19.94%, direct benefit transfers increased by 13.2%, and the state budget utilization against the approved record of proceedings for NTEP increased by 60%.

Additionally, Universal Drug Susceptibility Testing saw a delta of 2.25%, and treatment success improved by 1.38%.

Conclusions: TB-Watch is a no-cost, highly replicable model for automating the routine monitoring workflow. It provides a user-friendly solution for field-level targeted monitoring with offline action lists and leverages on existing TB surveillance system to enhance data-driven decision-making for improving programmatic performance.

SOA05-551-19 Digital transformation in TB surveillance: Enhancing health system responsiveness using Power BI in Telangana, India

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Background and challenges to implementation: Efficient data utilization is central to achieving National TB Elimination Program (NTEP) goals. However, decentralized health functionaries at the sub-district level often lack tools for real-time data visualization, delaying localized decision-making and response. Telangana adopted Microsoft Power BI to build an integrated dashboard that addresses this gap.

Intervention or response: Power BI-enabled visualization is used to improve TB program performance monitoring, responsiveness, and data-driven decision-making. Key performance indicators (KPIs) were extracted from Nikshay, the national TB surveillance system. These included presumptive examination rates, case notifications, treatment timelines, and diagnostic performance.

A dynamic dashboard was developed, offering facility-level drilldowns, conditional formatting for performance stratification, and real-time auto-updating charts. It was used routinely by program managers at state and district levels from April 2023 to March 2024.

Indicator	Pre-Dashboard (2023)	Post-Dashboard (2024)
Presumptive Examination Rate	1,050 / lakh	2146 / lakh
TB Notification Rate	175 / lakh	210 / lakh
Delay in Notification	5 days	2 days
Delay in Treatment initiation	7days	3 days
Manual Reporting Time (days/month)	7	2
Treatment Success Rate (DSTB)	85%	95%

Results/Impact: Power BI intervention led to a substantial improvement across critical KPIs (Table 1). Presumptive examination and notification rates increased by 28% and 20%, respectively. Microbiological confirmations rose from 62% to 78%, while treatment initiation within 7 days improved from 68% to 85%. Missed diagnostic opportu-

nities declined by more than half, and manual reporting time was reduced by over 60%. These improvements are visually summarized in Table 1.

Conclusions: Conclusion: Integration of Power BI into TB surveillance has strengthened health system responsiveness by decentralizing data access and enhancing analytical autonomy at the field level.

The intervention reduced reporting delays, improved oversight, and fostered a culture of real-time, evidence-based action.

This scalable digital approach can be replicated across vertical disease control programs to support India's broader digital health mission.

SOA05-552-19 Integrating socioeconomic determinants with tuberculosis surveillance: A data linkage approach to addressing TB burden and poverty in Indonesia

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Background and challenges to implementation: Tuberculosis (TB) continues to be a significant public health concern in Indonesia, where socioeconomic factors such as poverty, unemployment, and limited access to social support amplify the burden of the disease. To address this challenge, understanding the interplay between these social determinants and TB prevalence is crucial.

This study integrates data from the Tuberculosis Information System (SITB) and the National Extreme Poverty Targeting System (P3KE) to explore the relationship between socioeconomic vulnerabilities and TB at the household level.

Intervention or response: We conducted a data integration analysis by linking information from 417,614 individuals affected by TB, representing 404,585 households in SITB, with P3KE's dataset, which includes 237 million individuals. The integration was done using unique identifiers (ID) to match individuals by name and address. The data were analyzed using Tableau Public, which enabled a detailed exploration of the socioeconomic factors contributing to TB prevalence.

Results/Impact: The findings revealed that a significant portion of TB cases were concentrated in families, with 41.9% of cases affecting fathers, 32.4% children, and 20.5% mothers, highlighting the familial nature of TB transmission. The majority of individuals with TB were of working age (73.9%), with 44.56% unemployed.

Additionally, 45.78% of TB-affected households fell within the lowest socioeconomic deciles. The highest TB burden was observed in provinces such as West Java (10.4%) and East Java (6%).

Despite the high vulnerability, only 7.4% of affected households received support from *Program Keluarga Harapan (PKH)*, and 12.5% received food assistance.

Conclusions: This integration of TB and socioeconomic data reveals significant overlaps between TB prevalence and vulnerability, emphasizing the need for systematic data integration across sectors. Expanding social support for TB-affected households, particularly the most vulnerable, is essential. Data-driven, cross-sectoral interventions can address both TB and its social determinants effectively.

SOA05-553-19 Integrating genomics and digital innovation for tuberculosis surveillance in Nigeria

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Background: Nigeria ranks prominent among the high-burden tuberculosis (TB) endemic countries globally. Efforts to prevent TB are undermined by inefficient diagnostics and treatment systems, increasing drug resistance, and poorly understood transmission dynamics. Whole-genome sequencing (WGS) offers unprecedented resolution for understanding TB spread and resistance evolution, and provides a reliable framework for infection management. However, in Nigeria, its utility has been constrained by fragmented data systems and a lack of integrated analytical infrastructure.

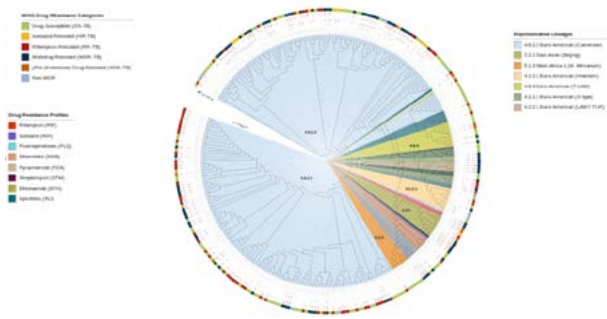
We aim to deploy a digital system that (1) streamlines and coordinates TB genomic surveillance and (2) advances the application of WGS data to inform TB research and support public health interventions.

Design/Methods: Leveraging the TB-Portals digital platform, we processed 105 newly-sequenced and 279 publicly available (NCBI) Nigerian *Mycobacterium tuberculosis* (*Mtb*) WGS datasets. We systematically screened and catalogued genomic markers associated with drug resis-

tance, virulence, diversity, and *Mtb* spread across different patient populations. Guided by these data, we are developing the Nigerian-TB-Genomic-Surveillance (NTBGS) platform to support real-time TB genomic surveillance and facilitate advanced interactive exploration of TB epidemiological trends across the country.

Results: The NTBGS platform currently hosts 384 *Mtb* genomic information across 15 Nigerian States and provides a geographically diverse genomic representation of TB infection dynamics in the country. Of these, 45.8% (176/384) are pan-susceptible, while 53.4% (205/384) show resistance to at least one drug.

Among the DR strains, 41% (84/205) and 7.3% (15/205) are rifampicin and isoniazid mono-resistant respectively, 34.6% (71/205) are multidrug-resistant, and 5.4% (11/205) are (pre-)extensively drug-resistant. Predominant lineages represented include isolates of Euro-American, *M. africanum,* and Beijing origin.



Conclusions: This initiative promotes sustainable integration of genomics for TB surveillance. We anticipate that the NTBGS platform will foster equitable WGS adoption, enhance TB management, bolster the National TB program, and position national datasets as globally relevant resources to accelerate diagnostic and therapeutic discoveries, vaccine design, and evidence-based interventions.

SOA05-554-19 Connectivity technology monitors and reduces high test error rates reported among drug resistance TB testing in Nigeria

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Background and challenges to implementation: Nigeria is a high-burden country for drug-resistant tuberculosis (DR-TB). However, national diagnostic and surveillance capacities are compromised due to high error rates on GeneXpert MTB/RIF machines testing for DR-TB. The Nigerian Tuberculosis and Leprosy Control Program (NTBLCP) pursued the development of a cost-effective technology, GxAlert/Aspect, to improve DR-TB reporting speed and accuracy and to monitor individual GeneXpert machine error rates to strengthen both healthcare system responses to DR-TB and management of GeneXpert investments.

Intervention or response: GxAlert/Aspect is an innovative, cost-effective solution that networks GeneXpert machines, sending average error rates by individually identified machines in real-time to an online database, making reporting time from months to seconds and enabling more timely interventions such as recalibration of machines and staff supervision. GxAlert/Aspect also tracks the status of service warranty and module replacement for each device.

Results/Impact: The GeneXpert testing error rate in 350 facilities decreased to 5% and below in September 2024 from 9% and above in September 2023. Data on machines producing higher than normal error rates were uploaded automatically from GeneXpert systems to a secure online dashboard display to improve national-level program management. At the same time, SMS alerts were sent to Facility Managers, Local Government supervisors, and State program managers for immediate action. Faster, better quality data on the MDR-TB portion of total TB indicators are now reported with minimal error rates.

Conclusions: The use of GxAlert/Aspect to network GeneXpert test results and operational status is a cost-effective model for the national sustainability of rapid molecular diagnostic systems. Training and installation are done locally, and the technology uses local, readily available and affordable telecom modems. GxAlert enables quick remote technical support, troubleshooting, and maintenance of the GeneXpert machines and ongoing disease surveillance. Based on Nigerian experience, a scaleup of the GxAlert in high-burden DR-TB countries is recommended.

SOA05-555-19 Leveraging artificial intelligence predictive maintenance models for timely GeneXpert module replacement in tuberculosis diagnostics

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Background and challenges to implementation: The GeneXpert system has accelerated tuberculosis (TB) diagnosis since its endorsement by WHO in 2010 by providing rapid, accurate, and scalable molecular testing. The platform has enhanced diagnostic access but is prone to wear and failure over time. Delays in module replacement disrupt testing, hence compromising patient care. Traditional maintenance approaches, often reactive or based on fixed schedules, fail to account for the variable usage

patterns and environmental factors that influence module lifespan. To address this challenge, we introduced an innovative application of artificial intelligence (AI) predictive maintenance models to optimize the timing of GeneXpert module replacement, enhancing diagnostic efficiency and reducing downtime.

Intervention or response: This was a cross-sectional study carried out in Uganda, targeting TB testing sites with GeneXpert installed. An AI-driven predictive maintenance framework that integrates machine learning algorithms with real-time operational data from GeneXpert systems, including test volume, error logs, and environmental conditions was developed.

Data was collected from 300 GeneXpert machines at 280 GeneXpert sites from January 2022 to December 2024. A predictive model that employs xgboost algorithm to forecast module failure was then trained with high accuracy. Performance metrics, including precision, recall, and mean time to failure prediction, were assessed against conventional maintenance strategies.

Results/Impact: Findings demonstrated that the AI model accurately predicts 75-80% of all module failures 3 months before they happen. This prediction enables proactive scheduling of replacements, minimizing diagnostic interruptions and optimizing resource allocation. The model is able to adapt to diverse operational contexts with the potential for scalability across TB programs globally.

Conclusions: This AI model for monitoring GeneXpert module failure enhanced the reliability of GeneXpert systems and aligned with the broader goal of strengthening TB diagnostic infrastructure.

This study underscores the transformative potential of AI in TB diagnostics, paving the way for smarter, data-driven maintenance strategies in global health.

SOA05-556-19 Development of a novel digital lung auscultation annotation platform for improving artificial intelligence-powered lung sound classification algorithms: Auscultation Lab

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Background: Artificial intelligence (AI) lung sound classification algorithms may be useful diagnostic tools, especially in resource-limited settings lacking physicians. Training supervised AI algorithms requires labeled datasets annotated by human expert listeners. Beyond conventional auditory sound recognition, spectrograms can provide humans a powerful three-dimensional visual aid, displaying frequency ranges and sound intensity to enhance lung sound pattern recognition and differentiate lower from upper respiratory sounds or environmental noises.

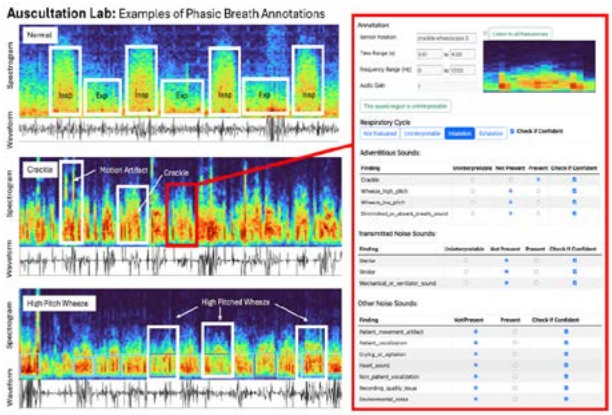
We aim to improve human listening panel training and thus AI lung sound classification by developing a novel annotation platform called Auscultation Lab that incorporates these features.

Design/Methods: A multi-modal platform was created for digital lung sound auscultation and listening panel training. Pediatric lung sound recordings were obtained from children ≤10 years old presenting to care at Tygerberg Hospital (South Africa) and Johns Hopkins Hospital (USA).

The platform allows for recording playback with spectrogram and waveform visualizations and the ability for detailed phasic or half breath-level annotations. Pediatric physicians created annotation boxes around each half breath to provide information on the respiratory cycle phase, adventitious lung sounds, transmitted upper airway sounds, and environmental noises with confidence levels for each annotation (Figure).

Results: To date, the platform has been used to train and certify nine pediatric physicians from the lung sound listening panel for the 'Xilonga' study. Members of the panel utilized the platform to annotate 63 pediatric chest position digital stethoscope recordings for a total of 781 half-

breath classifications of breath cycles, adventitious lung sounds (wheeze, crackle), transmitted sounds, environmental noises, and confidence levels.



Conclusions: Auscultation Lab utilizes spectrograms to provide a three-dimensional visual and auditory aid for detailed lung sound annotation and classification. This platform is an innovative tool for training lung sound listening panel physicians and thus advancing AI algorithm performance, and for teaching lung auscultation in medical education.

SOA05-557-19 Innovative use of mobile digital chest-Xray equipped with artificial intelligence (AI) to improve TB diagnosis among PLHIV at primary health centers (PHCs) in Lagos, Nigeria

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Background and challenges to implementation: Deployment of Mobile digital Chest X-Ray (CXR) vans equipped with artificial intelligence (CAD4TB) is a joint investment of the State Government and Global Fund to complement other interventions in TB program, to find and treat the missing persons with TB. The CXR intervention will further increase access to free TB screening and treatment as part of the Global Strategy to end TB. Three mobile CXR Vans, equipped with A.I(CAD4TB) was used for this activity. This provided an opportunity for adequate TB/HIV integration and collaboration at PHCs.

The objective of this study is to highlight the effectiveness of TB/HIV service integration at the PHCs, characterized with client referrals to other diagnostics centers.

Intervention or response: The use of mobile digital CXR at the PHCs for active TB case finding was conceptualized and conducted from January – December 2024 to address the existing 32% TB notification gaps in Lagos Nigeria. This however, provided an opportunity to adequately screen PLHIV for TB at PHCs. DHIS2 was used to determine the PLHIV currently on Treatment across 8 flagship PHCs in the State, following facility assessment and advocacy visit. TB facility cascade management team meeting were conducted and CXR mobile Vans deployed. WHO 3B TB screening algorithm was adopted. Specimen were collected and sent for GeneXpert test.

Results/Impact: For the A.I supported TB screening among PLHIV, the average TB yield as calculated is 23%, NNS and NNT calculated were 24 and 4 respectively given a better yield compared to the conventional TB screening (symptom screening) at 8% TB yield, 123 NNS and 12 NNT calculated respectively.

Type of TB screening (Screening with A.I supported CXR versus Symptom screening)	No. of PLHIV screened for TB with A.I supported CXR mobile machine	No. of TB presumptive among PLHIV	No. of TB presumptive clinically evaluated	No. diagnosed with TB	No. linked to care.	% TB yield	No. needed to screen (NNS)	No. needed to test (NNT)
TB screening using A.I supported CXR at PHCs	1,128	203	203	47	47	23%	24	4
Symptom screening at other Secondary facilities	7,898	789	789	64	57	8%	123	12

Conclusions: Artificial Intelligence powered Mobile Digital CXR has demonstrated efficiency in TB diagnosis among PLHIV while fostering adequate integration of TB/HIV. Therefore, the expansion of Mobile digital CXR equipped with A.I, will further strengthen this collaboration and improve quality of care among PLHIV in Nigeria.

SOA06 Window of opportunity: Integrated service delivery for co-morbidities

SOA06-558-19 Impact on patient wait times at Yala Sub-County Hospital through the integration of comprehensive care centers and tuberculosis clinics into mainstream outpatient health services

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Background and challenges to implementation: With the rapid expansion of HIV and TB treatment programs in sub-Saharan Africa, the enduring health policy discourse over the advantages and disadvantages of integrating comprehensive care centers and tuberculosis clinics with other outpatient health services has resurfaced.
Recent trials of integrating comprehensive care centers and tuberculosis clinics into conventional outpatient health services have demonstrated enhanced patient outcomes in certain areas, although have resulted in increased waiting times, potentially leading to adverse health effects over time.
Intervention or response: We examined a pilot intervention aimed at integrating comprehensive care centers and tuberculosis clinics into conventional outpatient health services at Yala Sub-County Hospital. We gathered data on patient waiting times during two five-day intervals preceding and three months following the integration, utilizing a time and motion study.
We conducted statistical analyses to determine any variations between the two observation periods regarding operational aspects such as personnel, appointment scheduling, and patient demographics. We developed a discrete event simulation model to enable an equitable comparison of waiting times prior to and following integration.
We additionally devised different integration configurations and assessed the resultant waiting times utilizing the simulation model.
Results/Impact: The integration of comprehensive care centers and tuberculosis clinics into standard outpatient health services led to a 20% and 24% rise in waiting times, respectively ($p<0.01$). Simulation modeling indicated that the substantial rise resulted from operational changes before to and following integration, including a reduction in personnel ($p<0.01$) and a varied patient demographic ($p<0.04$). Addressing these disparities via service integration would have led to a notable reduction in waiting times for conventional outpatient health treatments, alongside a small decline in service efficiency.
Conclusions: Integrating healthcare might potentially diminish wait times by optimizing the utilization of available resources.
Nonetheless, additional operational concerns, such personnel availability, must be taken into account to guarantee that integration does not adversely affect outcomes.

SOA06-559-19 Comorbidities, determinants and disability management in TB treatment: An observational cohort study under routine program conditions in YiChang, China

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Background: A significant proportion of successfully treated TB patients remain with TB-related functional disability, but most TB programs focus diagnosis and TB treatment only. It is suggested to manage comorbidities, risk determinants and disability at the start and the end of treatment.
Design/Methods: We conducted an observational cohort study in YiChang, China to assess burden of these problems at the start and end of anti-TB treatment; and whether referral mechanisms for further care were functional.
Results: Among 63 drug-susceptible TB patients treated under routine program conditions in China, 88% were symptomatic at treatment initiation (cough 60.3%, dyspnea 20.3%). Key comorbidities included diabetes (15.8%) and hypertension (7.9%), while risk determinants comprised smoking (17.4%) and excess alcohol use (12.6%). Functional disability (6MWT <400m) was observed in 25.3% of patients at baseline.·
At treatment completion (96.8% success rate), symptom prevalence decreased to 26.9% (cough 26.3%). Comorbidity rates declined to diabetes (14.2%) and hypertension (5%), with smoking (1.5%) and alcohol use (1.5%). Disability persisted in 15.8% of patients. All patients with these problems were referred to appropriate care. Referral systems functioned effectively for most comorbidities and risk factors (76.1-92% actually receipt the care) except for mental health disorder (18.0%) and pulmonary rehabilitation (9.45%).
Notably, patients with abnormal 6MWT at baseline showed significant improvement (25.3%→15.8%, $p<0.01$), particularly among older adults (54.5% abnormal in ≥60 age group). Smoking cessation interventions demonstrated success (10/11 smokers quit during treatment).
The combined questionnaire and 6MWT assessment required only 17.2 minutes per patient on average, demonstrating excellent feasibility for routine outpatient implementation.
These findings highlight both the progress and persistent gaps in managing TB-associated conditions through standard programmatic approaches.

Conclusions: Post-TB comorbidity and disability screening proves feasible in routine care, yet persistent gaps in mental health and pulmonary rehabilitation services require urgent programmatic strengthening for comprehensive patient management.

SOA06-561-19 Enhancing TB Detection in Ethiopia: Results from the Oromia TB Catch-Up Campaign

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Background and challenges to implementation: Tuberculosis (TB) remains a significant global health challenge, particularly in Ethiopia. The COVID-19 pandemic disrupted TB control efforts, likely contributing to increased undetected cases.
To address this, a one-month intensive TB Catch-Up Campaign was implemented in Oromia, Ethiopia, utilizing multiple strategies to enhance case detection among high-risk and vulnerable populations.
Intervention or response: The campaign covered 44 zones and 298 woredas in Oromia, targeting contacts of confirmed TB cases, diabetes (DM) patients, healthcare workers (HCWs), and Key Affected Populations (KAPs) such as prisoners, internally displaced persons (IDPs), and miners.
The campaign ran from April 1 to April 30, 2024, and employed three tailored interventions:
Intervention 1: Retrospective Contact Tracing
Health Extension Workers (HEWs) conducted house-to-house visits to map contacts of confirmed TB, drug-resistant TB (DRTB), and leprosy cases. Health professionals then performed community-based screenings, collecting sputum samples for lab testing. TB preventive treatment (TPT) was also provided to eligible contacts.
Intervention 2: Screening of High-Risk Groups
DM patients and HCWs were screened at health facilities, with sputum samples collected and sent to laboratories for testing.
Intervention 3: Screening of Key Affected Populations (KAPs)
Individuals in congregate settings (prisoners, IDPs, miners) were screened at designated sites, with sputum samples transported to labs for diagnosis.
Results/Impact: 1,187,951 individuals screened
57,064 presumptive TB cases identified
38,181 tested via GeneXpert and 18,883 via AFB microscopy
5,907 TB cases and 13 rifampicin-resistant (RR) TB cases detected
377 leprosy cases identified
8,388 individuals received TB preventive treatment (TPT)
Conclusions: The TB Catch-Up Campaign in Oromia, Ethiopia, demonstrated success in enhancing TB case detection through a multi-faceted approach, including contact tracing, high-risk group screening, and targeted interventions for vulnerable populations.
The campaign not only identified thousands of TB and leprosy cases but also provided preventive treatment to at-risk individuals.
These results highlight the importance of integrated, community-based screening strategies in high-burden settings

SOA06-562-19 Integrated service delivery for TB and non-communicable disease case detection using a primary health care approach in Cambodia

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Background and challenges to implementation: The COVID-19 pandemic led to decreased TB case detection in Cambodia, with an estimated one-third of cases undiagnosed. Simultaneously, non-communicable diseases (NCDs) like diabetes mellitus (DM) and hypertension (HTN) contribute significantly to premature mortality, but screening is limited.
Project Boost implemented integrated service delivery (ISD) to enhance TB and NCD detection among individuals ≥45y in Kampong Chhnang province.
Intervention or response: With TB Reach funding, Clinton Health Access Initiative collaborated with Kampong Chhnang Provincial Health Department to increase TB and NCD screening at 45 health centers (HCs) from Q2/2023 to Q4/2024, using two approaches: algorithmic screening at HCs and active case finding (ACF) community events. HC activities included symptom screening for TB/DM/HTN for those ≥45y, sputum GeneXpert testing for TB-symptomatic individuals, and blood pressure (BP) and blood glucose (BG) measurements.
At ACF events, upfront digital chest x-ray with artificial intelligence analysis (CXR-AI) was added, with sputum GeneXpert for those with TB symptoms or abnormal X-rays.

Results/Impact: Project Boost screened 364,989 individuals for TB, identifying 16,606 presumptive cases, doing GeneXpert for 10,163, and diagnosing 982 bacteriologically-confirmed TB cases and 2,123 total TB cases – double the target of 1,010 diagnoses. For NCDs, 16,264 had BG measured, diagnosing 3,197 with DM (19.7%). 74,554 had BP measured, with 10,371 diagnosed with HTN (13.9%).
Across 37 ACF events, 7,603 individuals had TB screening, 7,457 received CXR-AI, 1,228 (589 asymptomatic) showed abnormalities, 1,336 had GeneXpert, leading to 82 bacteriologically-confirmed cases.
Ultimately, 402 (175 asymptomatic) were diagnosed with all forms of TB. For NCDs, 7,448 had BG measured, with 1,041 (14.0%) having hyperglycemia and 603 starting DM treatment; 7,448 had BP measured, with 3,810 (51.2%) having HTN and 2,310 commencing treatment.
Conclusions: Project Boost demonstrated a successful model for integrated TB and NCD screening at HC and community level. ACF events in particular demonstrated high diagnostic yield for asymptomatic TB and NCDs.

SOA06-563-19 Mental health interventions in TB care: A systematic scoping review in the SAARC region

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Background: One in four people with TB face mental health challenges. Poor MH hinders TB health-seeking, treatment success, and post-treatment outcomes. We aimed to review approaches to provide MH care for people with TB in the South Asian Association for Regional Cooperation (SAARC) region, where 37% of people with TB live.
Design/Methods: Using Arksey and O'Malley's scoping review methods, we searched three databases (Medline, Embase, Global Health) for studies implementing an explicit mental health service or intervention to people undergoing TB screening, diagnosis and/or treatment in a SAARC country from 2000-2024. Extracted data were narratively synthesized.
Results: 2304 unique records were retrieved and yielded 17 eligible studies from India (n=10), Pakistan (n=6), and Nepal (n=1). Eight studies were among people with MDRTB.
Interventions included MH counselling (n=15, varied schedule, content, framework, and delivery approach), pharmacological intervention (n=9, anti-depressants, anxiolytics, withholding MDRTB drugs) and breathing exercises (n=1).
Interventions were implemented at clinics providing TB services (n=15) with off-site activities (n=5) and/or referrals to mental health centres (n=4); one was entirely via telehealth. MH professionals (psychiatrists, psychologists, n=9), nurses (n=1), social workers (n=3), pharmacists (n=1), and other cadres (peer supporters, patient navigators, lay counsellors, DOTS facilitators, n=9) were engaged in intervention delivery.
Mental health was assessed using standardized tools (n=14); five studies assessed substance use. All studies reporting post-intervention mental health outcomes (n=7) (anxiety, depression) and TB outcomes (n=10) (case notifications, treatment completion, adherence, failure, loss-to-follow-up, drug resistance, death) reported improved outcomes.
Improved patient satisfaction (n=2), quality of life (n=2), cardio-pulmonary measures (n=1), and reduced stigma (n=1) were also reported.
Seven studies implemented cointerventions: nutrition (n=5), economic support (n=7), and vocational rehabilitation (n=2).

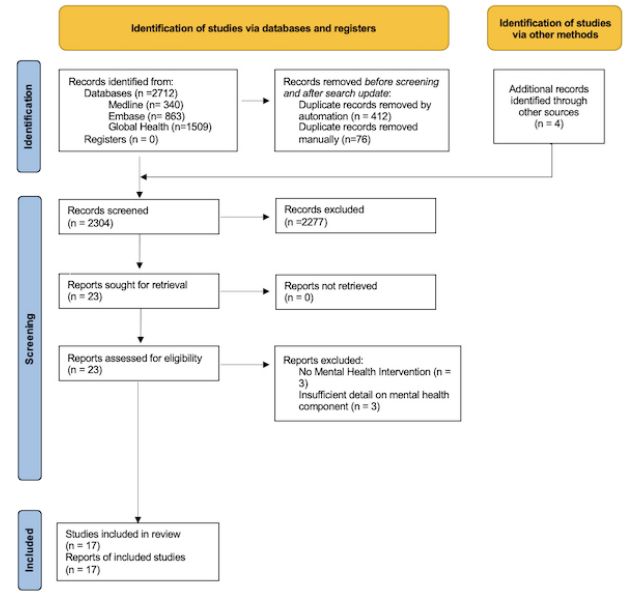

Figure 1. PRISMA CHART.

Conclusions: Effective people-centred TB care requires address to TB-comorbidities. We found MH interventions can be integrated in TB care settings to support achievement of improved TB and MH outcomes.

SOA06-564-19 Depression as a comorbid factor in patients with tuberculosis attending the rural Government TB Hospital in Tamil Nadu, India

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Background: Tuberculosis (TB) is still the largest infectious cause of illness and mortality worldwide. Medication noncompliance has been identified as a disadvantage in the successful management of this disease. TB is related with psychological morbidity, notably depression, which has been identified as a cause of poor compliance as well as increased morbidity and mortality from the disease. Despite this acknowledgement, little emphasis is made to identifying depression in TB patients.
The purpose of this study was to investigate the prevalence of depression in TB patients attending the rural Government TB hospital in Tamil Nadu, India, as well as the factors that may be linked with it.
Design/Methods: A cross sectional descriptive study was carried out among 130 TB patients in both outpatient and inpatient settings. Sociodemographic questionnaire and a nine item HADS scale designed to test for sadness anxiety and depression.
Results: The study included 130 patients, 61% of whom were men and 39% of whom were women. The respondents' average age ranged from 25 to 70 years. 57% of the patients suffered from depression. Depression was substantially related with sociodemographic characteristics and a clinical component (persistent cough).
Conclusions: Depression is a common disorder among tuberculosis patients in rural Tamil Nadu. Almost half of these patients have concomitant depression, and up to 90% present low to moderate treatment adherence. This poor adherence puts them at risk of becoming treatment defaulters, which increases the risk of development of drug-resistant tuberculosis.
Comorbid depression is an important issue in this patient population, and its effective management may improve treatment outcomes and lessen the burden of drug-resistant tuberculosis in rural communities.
Effective symptom control, particularly of coughing, and actions to enhance the socioeconomic position of this group of patients should be included in initiatives to minimize depression among TB patients.

SOA06-565-19 Developing a pilot clinical and programmatic handbook on integrated service delivery of tuberculosis, community-acquired pneumonia, asthma and COPD in Nigeria

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Background and challenges to implementation: In Tuberculosis high-burden countries like Nigeria, fragmented siloed health programmes result in poor coverage, high costs, inefficiencies and sub-optimal outcomes. WHO has long recommended the Practical Approach to Lung Health (PAL) for contextual application of integrated symptom-based management to detect TB and common lung conditions but requires bespoke country-level implementation and operational manuals/guides. Through TB REACH Wave 11 grant, RedAid Nigeria adapted PAL for multiple respiratory conditions (Tuberculosis, Community-Acquired Pneumonia, Asthma and COPD) and their major risk factors, cigarette smoking and indoor air-pollution. Project's active case-finding deploys digital tools as AI-enabled Chest X-rays, handheld peak expiratory flowmeters, and digital spirometers in 5 hard-to-reach districts of southern Nigeria.
Intervention or response: A 25-person Technical Working Group consisting of multidisciplinary interministerial stakeholders representing both programmatic, academia and clinical expertise was constituted to collaboratively develop clinical and programmatic guidance. Content development occurred within 3 sub-committees (Training and capacity building, SOPs and SBCC patient-facing materials, and Monitoring and Evaluation) through 4 hybrid meetings over a 6-weeks period.
Primary resources were international reference documents and national disease control guidelines, including the Nigerian-adapted integrated management of childhood illness chart booklet.
Results/Impact: Output generated was the first jointly produced Clinical and Programmatic Handbook on Integrated Service Delivery of multiple respiratory diseases (Tuberculosis, Community-Acquired Pneumonia, Asthma and COPD) in Nigeria. It formed the bedrock of the training manual and standard operating procedures for frontline health workers. It has been deployed in the 5 project districts for pilot implementation in Nigeria.

Critically, it also yielded a preliminary integrated monitoring and evaluation framework to be deployed by the national TB program.
Conclusions: The development of a unified ISD handbook using a robust stakeholder composition of a multidisciplinary team facilitated rollout of in-country adaptation of PAL strategy in Nigeria.
Lessons learnt from this pilot implementation will inform future strategies to improve efficiency and scale-up nationwide.

SOA06-566-19 Primary care visits: A window for timely tuberculosis screening in migrants to British Columbia, Canada?

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Background: In low tuberculosis (TB) incidence countries such as Canada, most TB diagnoses occur among people born outside the country, often due to the progression of infection acquired prior to migration. Ensuring timely TB prevention in primary care may accelerate elimination efforts.
We aimed to determine the timing of the first primary care visit among new permanent residents in British Columbia, Canada, and to estimate the potential impact of offering TB infection screening and preventive treatment at that first visit.
Design/Methods: We conducted a retrospective cohort study using linked health administrative data. We calculated the cumulative proportion of individuals accessing primary care and time from establishing permanent residency to their first visit. TB disease was considered potentially preventable if diagnosed ≥6 months after their first primary care visit, assuming rapid screening and preventive treatment could prevent progression. People with a high-risk medical indication for TB screening were censored. Descriptive statistics were used to summarize findings.
Results: Among 846,453 people in the cohort, 709,405 (83.8%) accessed primary care at least once during the follow-up period (median follow-up: 91.4 months, IQR: 48.9, 161.9).
Half of the cohort (n = 424,673; 50.2%) had their first visit within 15 months, and 75.3% (n = 637,625) within 35 months. In total, 1,327 individuals (0.16%) were diagnosed with TB disease. The median time to diagnosis was 53.4 months (IQR: 22.3, 104.8).
Of those diagnosed, 911 (68.7%) had no high-risk medical indication for screening. We estimate that 629 TB diagnoses, equivalent to 47.4% of all people diagnosed in the cohort, could have been potentially prevented by initiating the process of screening and preventive treatment at the first primary care visit (Table).

	N (%)
Total diagnosed with TB	1327
No high-risk medical indication for screening prior to TB disease diagnosis	911 (68.7)
Not preventable	
TB diagnosis before first primary care visit or <6 months after first primary care visit	251 (18.9)
No primary care visit before TB diagnosis	31 (2.3)
Potentially preventable*	
TB diagnosis ≥ 6 months after first primary care visit	629 (47.4)
Had a high-risk medical indication for screening prior to TB disease diagnosis**	416 (31.3)

**Under the assumption that TB infection screening and preventive treatment at the first primary care visit could prevent progression to TB disease ** Censored at time of high-risk medical indication*

Conclusions: Our findings suggest incorporating TB infection screening and preventive treatment into initial primary care encounters could support efforts toward TB elimination in low-incidence settings.

SOA06-567-19 Innovative models for TB/HIV integrated service delivery in Osun State

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Background and challenges to implementation: Tuberculosis (TB) and HIV co-infection remain a significant public health challenge, especially in high-burden settings. Integrated service delivery models improve outcomes by ensuring early diagnosis, timely treatment initiation, and better adherence. However, traditional TB/HIV service models often experience fragmented care, high loss to follow-up, and overburdened health facilities. This study explores innovative integration models and their impact on service efficiency and outcomes.
Intervention or response: Three TB/HIV integrated service delivery models were reviewed across multiple high-burden settings:
1. One-Stop Shop Model – TB and HIV screening, diagnosis, treatment, and counseling are provided at a single facility by a multidisciplinary team.

2. Community-Based Integrated Care – Decentralized care through trained community health workers (CHWs), mobile clinics, and home-based directly observed treatment (DOT).
3. Digital Health Integration – Use of shared digital platforms to track both TB and HIV services.
Key performance indicators, such as case detection rates, were analyzed. Qualitative data were collected from healthcare workers and individuals receiving care to assess feasibility and acceptability.
Results/Impact: Through the One-Stop Shop Model, 14,500 women accessed TB screening and HIV testing at engaged unconventional birth homes in Osun State. Community-Based Integrated Care led to a 45% increase in case detection among key populations and improved retention in care.
The Sample Logistics Dashboard improved accountability for TB and early infant diagnosis (EID) samples by tracking logistics and result retrieval. Both healthcare workers and individuals receiving services reported higher satisfaction with streamlined, person-centered care.
Identified challenges included training gaps, data harmonization issues, and funding sustainability.
Conclusions: Innovative TB/HIV integration models enhance patient outcomes, improve efficiency, and reduce loss to follow-up. Scaling up these models requires addressing operational barriers and strengthening policy, digital tools, and community engagement for sustainability.

SOA06-568-19 Localizing public-private mix: Advancing TB service integration through district government engagement in Indonesia

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Background and challenges to implementation: In Indonesia, 74.6% of individuals with TB symptoms initially seek care at private health facilities. However, it takes an average of six visits or 62 days before receiving a diagnosis, reflecting limited diagnostic and treatment capacity in private primary care (FKTP). An estimated 463,000 people with TB visit private clinics but remain undiagnosed, as most clinics refer presumptive cases without follow-up. Critical barriers include lack of personal protective equipment, diagnostics, basic supplies, infrastructure, and incentives—highlighting the need for stronger integration of private providers into national TB efforts.
Given Indonesia's decentralized health system, subnational governments are crucial for ensuring private sector engagement through local planning, budgeting, and regulation.
Intervention or response: To address these challenges, Stop TB Partnership Indonesia implemented targeted Public-Private Mix (PPM) advocacy in seven districts from March 2023 to June 2024. The intervention focused on three strategies:
1. Strengthening TB financing through local budgets and provider incentives;
2. Expanding the District PPM (DPPM) network to include diverse health facilities; and
3. Supporting enabling regulations and systems at the subnational level.
Advocacy workshops involving around 30 local stakeholders were conducted in each district, resulting in advocacy plans monitored by local civil society organizations.
Results/Impact: The initiative yielded significant outcomes. DPPM teams were revitalized through official decrees, and TB Elimination Task Forces (TP2TB) were established with actionable plans. Several districts issued policies recognizing private provider roles.
Collaboration between Puskesmas and private clinics was formalized, and 22 private facilities gained access to the national TB reporting system (SITB). Local governments began multisectoral budget mapping and integrated TB into district development planning. Some districts also initiated collaborations with private providers using local funds.
Conclusions: This initiative demonstrates how district leadership and public-private collaboration can institutionalize PPM and close service delivery gaps—paving the way for a more integrated and equitable TB response.

SOA06-569-19 Pharmacy engagement through hub and spoke model for tuberculosis case finding: An experience from four major cities of Nepal

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Background and challenges to implementation: Private pharmacies are often the first point of care for people because of convenient operating hours and personalized services. Engaging them is therefore critical to close gaps in access to tuberculosis (TB) care and services.
Intervention or response: The Public-Private Mix (PPM) approach has been implemented in four main cities following the hub and spoke model from March 2021 to January 2025. Pharmacies were linked based on the number of patients flows per day, the quantity of cough syrup, ex-

pectorant, antibiotic and anti-TB drug sales per month. A total of 250 pharmacies were oriented on the model of the National TB program. The pharmacies were linked with 70 private doctors/clinics which had chest X-ray facilities. The linkage was facilitated by PPM mobilizers. Pharmacies were responsible for TB symptomatic screening among patients seeking medical help, referring presumptive TB cases, collecting sputum samples and recording and reporting.

Results/Impact: Of the participating pharmacies, 70% were community-based while 30% had clinic/X-ray facilities. The proportion of active pharmacies (referring at least one presumptive TB case per month) increased from 44% in 2021 to 54% in 2025. The number of referrals and diagnosed TB cases rose, whereas the positivity rate dropped from 13% in 2021 to 4% in 2025.

A total of 79,312 presumptive TB cases were identified and evaluated for TB (15% GeneXpert, 12% Microscopy, 73% other diagnostic tools for TB), of which 3969 (5.2%) were diagnosed: 61.6% were pulmonary, 38.2% were extrapulmonary, and 0.2% were drug-resistant TB. This intervention strengthened TB service coverage and enhanced referral pathways between pharmacies, doctors and diagnostic facilities.

Year	Presumptive TB	GeneXpert	Microscopy	Other diagnostic tools	TB cases	Yield Rate
Mar 21 to Dec 2021	2698	378 (14%)	324 (12%)	1997 (74%)	353	13%
Jan 2022 to Dec 2022	15476	2262 (15%)	2769 (18%)	10445 (67%)	1108	7%
Jan 2023 to Dec 2023	25913	3513 (14%)	3447 (13%)	18953 (73%)	1136	4%
Jan 2024 to Jan 2025	35225	5721 (16%)	3328 (9%)	26176 (74%)	1372	4%
Total	79312	11874 (15%)	9868 (12%)	57571 (73%)	3969	5%

Table 1: Year wise presumptive TB evaluated using different test and diagnosed TB cases.

Conclusions: Expanding private pharmacy engagement in TB program is essential. Future efforts should ensure accessibility of molecular WHO-recommended rapid diagnostic test, availability of sufficient advocacy materials, and establish a system to track patient visits to pharmacies for improved monitoring and case detection.

SOA07 Managing drug-resistant TB in the 21st century: Data, diagnostics and delivery

SOA07-570-19 Prevalence and risk factors of drug-resistant TB in Nepal: Findings from the sixth national drug-resistance TB survey

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Background: Tuberculosis continues to be a major public health concern in Nepal, with an estimated incidence rate of 229 cases per 100,000 people in 2023. Treatment coverage reached only 54%, leaving 46% of TB cases undetected. The estimated number of drug resistant tuberculosis (DR-TB) was 3,000, but only 693 were diagnosed, with 21% (147 cases) lost to follow-up at the initial stage. Nepal's National TB Program conducted its sixth drug-resistance TB survey in 2023 to update resistance patterns, confirm trends in rifampicin-resistant TB (RR-TB) and multidrug-resistant TB (MDR-TB).

Design/Methods: A cross-sectional survey administered based on World Health Organization protocols. Fifty clusters were selected from three strata, focusing on newly registered, bacteriologically confirmed pulmonary TB cases diagnosed via sputum smear microscopy or Xpert/MTB RIF at diagnostic centers. We utilized a paper-based clinical information form and conducted face-to-face interviews.

Data collection spanned 14 months, involving 1,768 patients (1,592 newly diagnosed and 176 previously treated) whose samples exhibited mycobacterium tuberculosis complex growth in culture. These samples underwent additional drug susceptibility testing (DST) using the mycobacteria growth indicator tube (MGIT) method for phenotypic DST and the line probe assay (LPA) for genotypic DST. Data analysis was conducted using R-studio.

Results: The prevalence of MDR TB was 2.1% (95% CI: 1.3-3.5) among newly diagnosed patients and 10.1% (95% CI: 5.1-19) among previously treated. The overall prevalence of pre-extensively drug-resistant TB was 1.3% (95% CI: 0.6-2.7) in new patients and 3.4% (95% CI: 1.2-8.8) in previously treated cases. Among rifampicin-resistant patients, 48.3% (95% CI: 35.2-61.7) had pre-XDR TB.

Conclusions: History of previous TB treatment was the only statistically significant risk factor ($p < 0.05$) for rifampicin-resistant TB (OR: 4.1; 95% CI: 2.6-6.4). Other factors such as HIV status, diabetes, and age group were not found to be statistically significant.

SOA07-571-19 Dominance of Lineage 2 and clonal endemic transmission of TB in Bhutan

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Background: In Bhutan, tuberculosis (TB) incidence has gradually decreased over the past decade; however, multidrug resistant tuberculosis (MDR-TB) case detection has risen sharply with a wide detection gap compared to WHO estimates.
This study investigates sources and transmission dynamics of TB to inform effective ending TB strategies.
Design/Methods: We retrospectively performed whole genome sequencing (WGS) on all pre-treatment, culture-positive *Mycobacterium tuberculosis* (MTB) isolates processed at Bhutan's National TB Reference Laboratory between 2016 and 2018. Local transmission was assessed by clustering sequences at 5 and 12 single nucleotide polymorphism (SNP) thresholds.
To evaluate cross-border transmission, we analysed publicly available MTB sequences from Bangladesh, China, England, India, Nepal, and Tibet, alongside sequences from Bhutan. Lineage-specific, time-scaled phylogenetic trees were constructed and geographic origins of ancestral strains were estimated using stochastic mapping.
Results: Among 899 sequences, 890 were single-lineage MTB and included in this analysis. Lineage 2 was predominant (496/890, 67%) and contained most drug-resistant TB (DR-TB) isolates (160/178, 90%).
A single Lineage 2 outbreak clade was responsible for 85% of all MDR-TB cases (99/117). A high proportion of isolates clustered at both 5 SNP (548/890, 62%) and 12 SNP thresholds (665/890, 75%), with Lineage 2 exhibiting the highest clustering (496/596, 83%).
Recent cross-border transmission occurred exclusively within Lineage 2, with four clusters sharing recent ancestors dated within 30 years. Historical introductions varied by lineage: Lineages 1 and 3 originated earlier from South Asian neighbours, primarily India; Lineage 2 emerged most recently from China via Tibet; and Lineage 4 was introduced through England and India during the British colonial period.

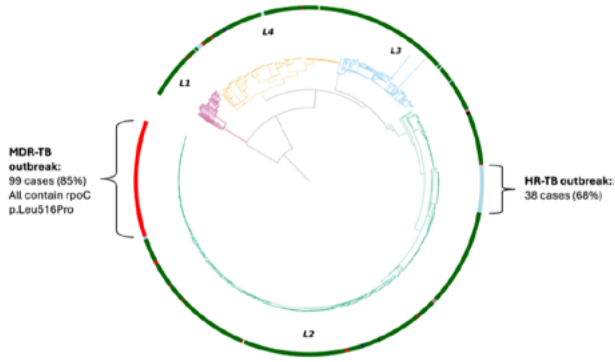

Figure: Phylogenetic reconstruction identifies dominant Lineage 2 clades driving MDR-TB transmission in Bhutan.

Conclusions: Despite its more recent introduction, Lineage 2 dominates TB in Bhutan, with most MDR-TB cases clustered and primarily driven by local transmission rather than migration/reactivation. Targeted interventions to disrupt transmission in high-burden areas, will be crucial for effective TB prevention and care.

SOA07-572-19 Application of targeted next-generation sequencing (tNGS) in diagnosis and drug resistance prediction of extrapulmonary TB

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Background: Extrapulmonary tuberculosis (EPTB) is a complex health issue with increasing challenges due to drug-resistant strains. Targeted next-generation sequencing (tNGS) offers a promising approach for rapid and accurate diagnosis and resistance prediction directly from clinical samples.

Design/Methods: A prospective study was conducted from July 31, 2021, to December 31, 2024, at Shenyang Tenth People's Hospital, assessing diagnostic accuracy and resistance prediction using tNGS, Xpert, and culture drug sensitivity testing on extrapulmonary specimens from adults suspected of EPTB.

Results: Finally, 211 adults suspected of EPTB were included in the study, including 130 males and 81 females, aged 49±16.97. The sensitivity and specificity of tNGS to microbiologically and clinically confirmed TB were 73.3% (95% CI, 64.9%-81.8%) and 98.1% (95% CI, 95.5%-100.0%).

The manifestations of tNGS in different specimen types, among the cases confirmed by microbiological diagnosis and clinical diagnosis, tNGS showed the highest sensitivity (86.4%) in lymph node and soft tissue, moderate sensitivity (80.5%) in bone tissue, and relatively low sensitivity (61.8%) in pleural effusion. tNGS showed variable sensitivity to the prediction of drug resistance. The sensitivity of rifampicin resistance was 58.3%(95% CI, 31.4%-80.9%) and the specificity was 97.9%(95% CI, 94.4%-99.3%) based on Xpert.

According to pDST, the sensitivity of tNGS to isoniazid resistance was 40.0%(95% CI, 9.1%-73.7%), the specificity was 97.0%(95% CI, 92.2%-99.1%), and the sensitivity to rifampicin resistance was 80.0% (95%). 98.1%), the sensitivity to streptomycin was 75.0%(95% CI, 29.7%, 95.6%), the specificity was 95.1%(95% CI, 89.5%-98.2%).

Conclusions: tNGS is an effective diagnostic tool, which can be used for rapid diagnosis of EPTB. Its high sensitivity and specificity in the diagnosis of EPTB make it an important supplement to traditional diagnostic methods. The variability of drug resistance diagnosis needs to be further verified and solved in clinical application, and the best application mode of drug resistance diagnosis in EPTB management should be explored.

SOA07-573-19 Can targeted mentorship enhance multi-drug-resistant TB detection in resource-limited settings like Malawi? A quasi-experimental evaluation

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Background and challenges to implementation: The 2018-2019 drug resistance survey in Malawi reported multidrug-resistant or rifampicin-resistant TB (MDR/RR-TB) in 2.3% of new and 6.1% of previously treated TB cases. However, the proportion of MDR/RR-TB detection among notified TB cases remains low, primarily due to gaps in healthcare workers' knowledge and skills. This evaluation assessed whether the mentorship program aimed at strengthening competence in drug-resistant TB (DR-TB) management enhanced case detection.

Intervention or response: The program, supported by the USAID-TB Implementation Framework Agreement (TIFA) mechanism, implemented targeted mentorship interventions to improve DR-TB case detection. A mentorship tool was developed with thematic areas designed to address challenges in DR-TB case detection.

Targeted healthcare workers at the intervention sites received monthly mentoring on these topics for nine months. Mentors were trained to assess the performance of both facilities and mentees using the tool. Mentorship support was offered in 15 of the 29 districts in Malawi from March 2023 to February 2024. Regular performance monitoring was carried out to track progress.

Results/Impact: A pre-and post-intervention assessment evaluated the impact of mentorship on MDR/RR-TB case detection. Between 2022 and 2024, in intervention sites, cases increased by 76%, rising from 74 to 130 cases. Non-mentorship sites experienced a slight increase of 2%, from 43 to 44 cases.

The increased case detection in intervention sites demonstrates the positive impact of mentorship support on improving MDR/RR-TB case detection. This also contributed to a 49% increase in national MDR/RR-TB case detection, rising from 117 to 174 cases.

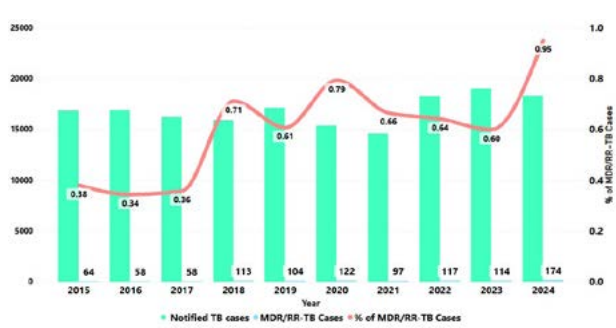

Figure 1. The proportion of MDR/RR-TB among notified TB cases

Conclusions: This targeted mentorship enhanced MDR/RR-TB case detection in intervention sites, supporting the necessity for scaling up and routine implementation. This approach provides lessons for implementing similar interventions in resource-limited settings to strengthen competence and improve MDR/RR-TB case detection. Further studies should explore the cost-effectiveness of mentorship to inform policy adoption.

SOA07-574-19 Tackling drug-resistant TB in Punjab, Pakistan: Treatment regimens and outcomes from a cohort study

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Background: Multi-drug and rifampicin resistant tuberculosis (MDR/RR-TB) represent a major challenge in Pakistan. Since 2021, Médecins Sans Frontières, with National and Provincial TB programs, provides MDR/RR-TB care in Gujranwala, Punjab. While bedaquiline-based regimens have improved treatment care, emerging resistance threatens progress. We assess MDR/RR-TB treatment regimens used in this context, resistance patterns, and treatment outcomes.
Design/Methods: A retrospective analysis on MDR/RR-TB patients enrolled between December 2021 and March 2025. Regimens received were individualized long treatment (LTR, 18–24 months), a 6-month bedaquiline-pretomanid-linezolid with or without moxifloxacin (BPaL/M), or bedaquiline 9-11-month all-oral shorter treatment (STR). Baseline bedaquiline phenotypic drug susceptibility testing (DST) was performed. Enrolment periods varied by regimen to describe treatment outcomes (before September 2023 for LTR and before September 2024 BPaL/M and STR).

	Longer individualised regimen (LTR)	BPaL/M	Bedaquiline short regimen (STR)	Total
N (%)	205 (43.1%)	196 (41.2%)	75 (15.8%)	476 (100.0%)
Age Median [IQR]	39.0 [24.0; 55.0]	33.0 [21.5; 53.5]	23.0 [9.0; 37.0]	33.0 [21.0; 53.5]
HIV Positive status	3 (1.5%)	3 (1.5%)	0 (0.0%)	6 (1.3%)
Diabetes	61 (29.8%)	53 (27.0%)	10 (13.3%)	124 (26.1%)
Hepatitis C	33 (16.1%)	22 (11.2%)	5 (6.7%)	60 (12.6%)
Bilateral disease	88 (42.9%)	89 (45.4%)	20 (26.7%)	197 (41.4%)
Smear positive	65 (31.7%)	32 (16.3%)	12 (16.0%)	109 (22.9%)
Confirmed pre-extensively drug-resistant-TB (pre-XDR TB; MDR/RR-TB with fluoroquinolone-resistance)	71 (34.6%)	47 (24.0%)	0 (0.0%)	118 (24.8%)
Confirmed extensively drug-resistant-TB (XDR TB; pre-XDR with additional resistance to bedaquiline or linezolid)	4 (2.0%)	0 (0.0%)	0 (0.0%)	4 (0.8%)

Results: Main baseline characteristics of 476 patients (53% male) are in the table. Patients receiving LTR had more risk factors and baseline drug resistance. Amongst patients with baseline bedaquiline DST, 5% (10/201) had bedaquiline resistance. Of those with bedaquiline resistance, 3 had previous bedaquiline exposure (seven had prior TB treatment: four with second-line drugs), nine received LTR and one BPaL/M.
Treatment outcomes were for 137 patients on LTR, 74% (101/137) success, 6% (8/137) lost-to-follow-up (LTFU), 6% (8/137) failure, and 15% (20/137) death. For 101 patients on BPaL/M, 95% (96/101) success, 2% (2/101) LTFU, 2% (2/101) failure and 1% (1/101) death. For 50 patients on STR, 78% (39/50) success, 10% (5/50) LTFU, 10% (4/50) failure, and 4% (2/50) death.
Conclusions: BPaL/M showed high success rates in eligible patients. Despite having less risk factors and baseline resistance than patients on BPaL/M, patients on the STR had poorer outcomes. Moderate levels of baseline bedaquiline resistance is concerning considering bedaquiline is a key drug in all treatment regimens. New drugs are needed to provide treatment options for these patients.

SOA07-575-19 Characteristics, risk factors, and treatment outcomes of isoniazid mono-resistant TB in Cambodia: A retrospective study using Xpert XDR technology

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Background: Isoniazid (INH) mono-resistant tuberculosis (Hr-TB) is a prevalent form of drug-resistant tuberculosis (TB), but its detection has historically been very low, primarily due to limitations in phenotypic drug susceptibility testing (DST). By late 2022, Xpert XDR 10-color technology became available in Cambodia at MDR-TB treatment sites, offering a more efficient diagnostic tool for detecting Hr-TB.
Design/Methods: We retrospectively reviewed the medical records of Hr-TB patients treated in Cambodia between January 2023 and September 2024. Samples that tested positive for Mycobacterium tuberculosis (MTB) and negative for Rifampin were further tested using the Xpert MTB/XDR assay to identify Hr-TB.
Results: A total of 203 Hr-TB patients were included in the study. Of these, 123 (60.6%) were male, and the median age was 48 years [interquartile range: 37-62 years]. Among the patients, 32% had a history of prior TB treatment, while 171 (80%) had newly diagnosed TB, 197 (97%), had pulmonary TB, 9 (4.4%) patients had HIV co-

infection, and 43 (21.2%) had diabetes. Mutations in the katG gene were identified in 95 (46.8%) patients, including 4 with gyrA mutations.
Mutations in the inhA gene were found in 90 (45.3%), including 2 with gyrA mutations, and 16 (7.9%) had mutations in both katG and inhA. Regarding treatment outcomes, 184 (90.6%) had favorable outcomes, 17 (8.4%) died, and 2 (1.0%) were lost to follow-up.
In terms of mortality, prior TB treatment (OR=2.4, 95% CI: 0.79-7.42, p=0.156), HIV co-infection (OR=1.3, 95% CI: 1.16-11.69, p=0.556), diabetes (OR=0.8, 95% CI: 0.22-3.01, p=0.769), and mutations in both katG and inhA (OR=2.8, 95% CI: 0.71-11.07, p=0.140) were not significantly associated with mortality.
Conclusions: This study demonstrates that Hr-TB is prevalent in Cambodia, with the Xpert XDR assay serving as an important tool for detecting drug resistance. No significant associations were found between risk factors and mortality outcomes.

SOA07-576-19 Effects of pyrazinamide and/or ethambutol resistance on TB treatment outcomes determined by whole genome sequencing, South Africa, 2020 - 2025

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Background and challenges to implementation: In South Africa, both pyrazinamide (PZA) and/or ethambutol (EMB) were included in the all-oral short-course regimen despite the high resistance rates to pyrazinamide (PZA) and/or ethambutol (EMB) reported among people with MDR-TB. The effect of resistance to these drugs on treatment outcomes are poorly understood.
This study evaluated the effects of PZA and/or EMB resistance on treatment outcomes among MDR-TB cases treated with the all oral short course regimen in South Africa from 2020 to 2022.
Intervention or response: We conducted a retrospective cohort study of people with MDR-TB detected through whole genome sequencing. Drug susceptibility patterns for PZA and EMB were classified into four categories: susceptibility to both drugs (EMB-S & PZA-S), resistance to PZA only (EMB-S & PZA-R), resistance to EMB only (EMB-R & PZA-S), and resistance to both drugs (EMB-R & PZA-R). Treatment outcomes were categorized as either successful patient outcomes (SPO) or unsuccessful patient outcomes (USPO). A directed acyclic graph (DAG) guided the selection of variables for the generalized linear model.
Adjusted incident rate ratio (aIRR) were calculated with 95% confidence intervals using modified Poisson regression with robust error variances.
Results/Impact: Among the 598 people with MDR-TB included in the analysis, 60% (356/598) were resistant to one or both TB drugs drugs.
There was little evidence that resistance to PZA and/or EMB increased USPO: resistance to PZA (aIRR = 1.18, 95% CI: 0.86–1.63), resistance to EMB alone (aIRR = 0.94, 95% CI: 0.67–1.32), and resistance to both drugs (aIRR = 0.97, 95% CI: 0.73–1.27).
Conclusions: This study emphasizes the complexity of understanding the effects of PZA and EMB resistance on MDR-TB outcomes. Investigations into circulating MDR strains across provinces would be beneficial to this understanding.
There is no evidence that PZA and/or EMB resistance influences the TB treatment outcomes and should not be included in this regimen.

SOA07-577-19 Early treatment outcomes for the six-month BPaLM regimen under programmatic conditions in Ethiopia

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Background and challenges to implementation: Drug resistant tuberculosis (DR TB) remains a major public health concern. To improve the adherence and treatment outcomes of DR TB patients, the World Health Organization recommends the implementation of the six-month BPaLM regimen. This regimen is composed of Bedaquiline, Pretomanid, Linezolid, (600mg) and Moxifloxacin and has been implemented in Ethiopia since September 2023.
Regular follow up to monitor the effectiveness during programmatic implementation is essential to ensure the quality of care provided to patients.
Intervention or response: We described the routine national DR TB data of the district health information system (DHIS2) from 55 DR TB treatment initiating centers during September 2023-March 2024.
We compared the outcome of MDR-TB patients on six-month BPaLM regimen (in seven regions of Ethiopia with a population of 93 million people, 85.3% of the national) with the outcome of other DR TB regimen and all TB cases of similar period of national report using two sample proportion tests in STATA.

Results/Impact: A total of 189 patients were enrolled in the six-month BPaLM regimen. About 41% (77) were females. The mean age of DR TB patients was 31.8 years with a standard deviation of 15.1 years. Treatment was successful in 94.1% of patients including cure (73.5%) and treatment completion (20.6%).
The success rate is significantly greater than the 78% for DR TB cases (Z-test=4.96, p-value=<0.0001)) and 86% for all forms of TB (Z-test=3.21, p-value=0.0013) in Ethiopia. Five (2.6%) patients were lost to follow-up, two (1.1%) patients failed, and four (2.1%) died. The death rate is significantly lower than the 12% patients on the other regimens (Z-test=3.99, p-value=0.0001).
Conclusions: The six-month BPaLM regimen could contribute to better treatment outcome by improving treatment completion, decreasing lost to follow up, and reducing mortality. Routine patients follow up is required after treatment completion to prevent relapse.

SOA07-578-19 Long-term treatment outcomes of multi-drug-resistant TB/ rifampicin-resistant TB in Latvia

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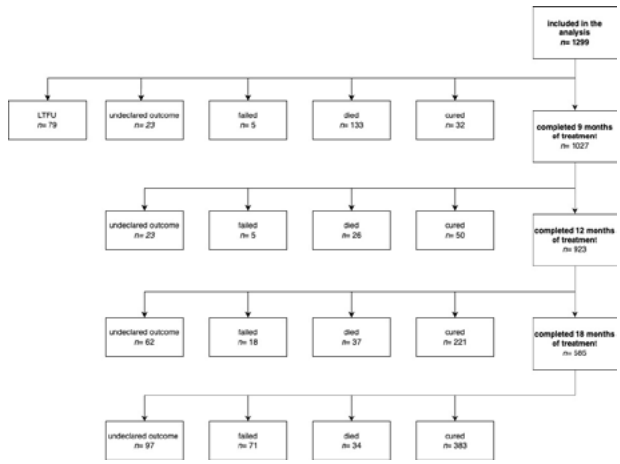
Background: In Latvia, a high-priority country for tuberculosis (TB) in the WHO European Region, 11% of newly registered TB cases are multidrug-resistant and rifampicin-resistant (MDR/RR-TB). MDR/RR-TB is associated with significantly worse individual treatment outcomes, based on standard definitions that typically censor outcomes at the end of treatment. However, data on long-term treatment outcomes remain limited.
Design/Methods: A retrospective cohort study included all adult MDR-TB patients with genotypic rifampicin resistance in Latvia from 2005–2021. Data were collected from the national MDR/RR-TB database, patient records, the Centre for Disease Prevention and Control, outpatient providers, and regional TB offices. Treatment outcomes were classified using TBNET definitions.
Results: The study included 1,299 MDR/RR-TB patients (median age: 44 years; IQR 34–53), of whom 973 (74.9%) were male. Among them, 230 (17.7%) were classified as pre-extensive drug-resistant (pre-XDR). Median treatment duration was 17.4 months (IQR 10.5–19.9). At least 9 months of anti-TB treatment was received by 1,027 (79.1%) patients, ≥ 12 months by 923 (71.1%) patients, and ≥ 18 months by 585 (45%) patients.
Outcomes included: 686 (52.8%) cured, 99 (7.6%) treatment failure, 230 (17.7%) deaths, 79 (6.1%) lost to follow-up, and 205 (15.8%) undeclared outcomes. Follow-up data were available for ≥1 year in 848 (65.3%), ≥2 years in 749 (57.7%), and ≥5 years in 515 (39.6%). Of those, relapse-free rates were 98.6% (n=836) at 1 year, 98.3% (n=736) at 2 years, and 98.1% (n=515) at 5 years. Survival rates were available for 1246 patients: 81.6% (n=1,017) were alive after 1 year, 77.6% (n=968) after 2 years, and 67.7% (n=843) after 5 years.



Conclusions: Many patients classified as "treatment failure" due to treatment durations <18 months remained TB-free post-therapy. Long-term follow-up should be incorporated into MDR/RR-TB outcome definitions to reflect patient prognosis better.

SOA07-579-19 Predicting drug-resistant TB outcomes: Examining pill-taking behaviours for bedaquiline

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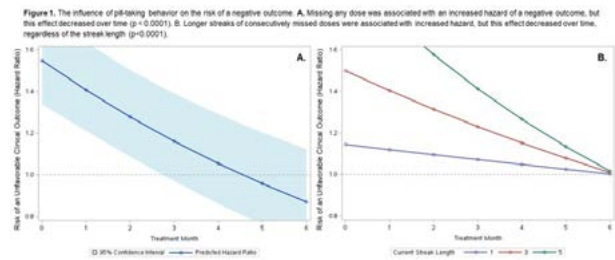
Background: Tuberculosis (TB) is a leading cause of mortality among people living with HIV, particularly in South Africa, driven by high rates of drug-resistant TB (DR-TB) and HIV co-infection. Research by our team has shown that cumulative six-month bedaquiline adherence, measured using an electronic dose monitoring (EDM) device, is a key predictor of clinical DR-TB outcomes in people living with HIV. However, the measure of cumulative adherence alone may identify individuals at risk for a negative clinical outcome too late for effective intervention.
This analysis aimed to determine whether specific patterns early in the course of DR-TB treatment can identify individuals at risk for negative outcomes sooner than cumulative adherence alone.
Design/Methods: Participants with DR-TB and HIV co-infection initiating a bedaquiline-containing regimen were recruited at a TB-referral hospital in Durban, KwaZulu-Natal, South Africa, 2016-2020 (the PRAXIS study, NCT03162107, NCT04032730) in Durban. We collected pill-to-pill bedaquiline adherence data over a six-month period using EDM device Wisepill RT2000. Time-varying Cox proportional hazards modeling was performed to examine the association between pill-taking behaviors and DR-TB treatment outcomes.
Results: Of 283 enrolled participants, 282 provided EDM bedaquiline adherence data. Timing of missed doses and number of consecutively missed doses ("streaks") were both independently and statistically significantly associated with an increased hazard of a negative outcome ($p<0.0001$, $p<0.0001$ respectively) (Figure 1, panels A and B).
Regardless of whether doses were missed consecutively or sporadically, the hazard for a negative outcome decreased by month of treatment (Figure 1, panels A and B).



Conclusions: Varying patterns of medication adherence were significantly associated with clinical DR-TB outcome. The indication that early missed doses were most strongly associated with negative treatment outcomes highlights the importance of treatment adherence support strategies, particularly at the beginning of treatment or when the patients begin in missing consecutive doses.

SOA07-580-19 The association between adherence and treatment outcomes among people with rifampicin-resistant TB who used the electronic pillbox in South Africa

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Background: Poor rifampicin resistant tuberculosis (RR-TB) treatment outcomes are a global concern. The World Health Organisation reported 68% treatment success rate globally among people who started RR-TB treatment in 2021. Digital Adherence Technologies (DATs) such as electronic pillboxes are being evaluated as approaches to improve outcomes. There is lack of data on understanding the relationship between digitally recorded adherence and TB treatment outcomes.
Our objective was to explore the association between adherence and poor treatment outcomes among people with RR-TB in South Africa.
Design/Methods: Data were obtained from a cohort of adults with RR-TB who participated in a pillbox observational study and started treatment between 04/2021-

03/2022 in two South African provinces. Adherence was measured by daily data on electronic pillbox openings as a proxy for doses taken, using pillbox data for the first two months of treatment. Treatment outcomes were ascertained from the TB registers. We used logistic regression to examine the association between adherence percentage categories (<90% and ≥90%) with poor treatment outcome (composite of death, treatment failure, loss to follow up) controlling for confounders.

Results: Preliminary analysis included 184 participants. Sixty-two percent were male, median age was 37 years, 54% were on short regimen, and 60% were living with HIV. Forty-eight percent (89/184) had <90% adherence and 28% (51/184) had a poor end of treatment outcome. In an adjusted analysis: controlling for gender, age, HIV status and short/long regimen, those with <90% adherence had a two-fold higher odds of the poor outcome compared to the group with the highest adherence (≥90%), (OR 2.05, 95% CI 1.03-4.08; p=0.041).

	Poor outcomes / N	Unadjusted OR(95% CI)	p-value	Adjusted OR* (95% CI)	p-value
Adherence					
0-89%	32/89 (62.7%)	2.24	0.0017 (1.15-4.35)	2.05 (1.03-4.08)	0.041
90-100%	19/95 (37.3%)				

**Adjusted for HIV status, gender, age and long/short regimen.*

Conclusions: Lower adherence levels, as measured by DATs, are associated with increased risk poor RR-TB treatment outcomes. Interventions targeting adherence are needed to improve TB treatment outcomes.

SOA07-581-19 Leveraging digital adherence technology and tele-counselling to improve monitoring of drug-resistant TB in Nigeria

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Background and challenges to implementation: Nigeria ranks 6th globally and 1st in Africa among high-burden TB countries. While diagnostic and treatment services have expanded, challenges remain with drug-resistant TB (DR-TB), notably low adherence to prolonged, complex regimens. Psychosocial factors—including fear, isolation, and stigma—often lead to treatment fatigue, disengagement, and loss to follow-up.

In response, a pilot project assessed the impact of combining digital adherence technology (DAT) with tele-counseling to improve DR-TB treatment adherence. Interra Networks Limited, providers of the National TB Call Centre (3340), implemented the pilot with the National TB Program and USAID implementing partners.

Intervention or response: The pilot ran from June 2024 to March 2025 in Lagos, Osun, and Kano state, integrating two activities:

1. MedAdher, a digital adherence tool which tracks daily medication intake, and;
2. Structured tele-counseling sessions by trained health counselors to provide emotional support, education, and address patient-reported challenges.

DR-TB patients were enrolled at treatment initiation and received counseling scheduled to align with treatment stages (regimen: BPALM). Real-time adherence data triggered follow-up calls and, when necessary, escalations to health facilities.

Results/Impact: By September 2024, 268 DR-TB patients consented to counseling. Preliminary analysis showed a significant improvement in adherence. Of those, 262 completed treatments, achieving ≥98% adherence compared to 93% from baseline data. Compared to a previous study using digital adherence monitoring alone, this dual intervention recorded an 11.5% increase.

Amongst the benefits, patients reported a better understanding of side effects, and increased motivation, contributing to higher completion rates.

Conclusions: This pilot demonstrates the potential of combining digital tools and psychosocial support to close adherence gaps. Scaling such innovations nationally could reduce TB treatment failure and loss to follow-up. Further study is needed to control for external variables and confirm the intervention's specific impact.

E-POSTER SESSION (EP)

EP10 Enhanced TB detection: Integrating digital radiography with other tools

EP10-790-19 A decade of impact: How the South African TB Think Tank transforms evidence to policy and programming

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Background and challenges to implementation: South Africa remains among the highest TB-burden countries, with 270,000 TB cases reported in 2023, yet only a 72% treatment coverage and a TB mortality rate of 56/100,000. Despite the country's robust research landscape, translating evidence into policy remained a challenge. To address this, the National Department of Health required a sustainable solution to bridge the gap, leading to the establishment of the South African National TB Think Tank (TBTT) in 2014.
Intervention or response: TBTT is a multidisciplinary, evidence-driven advisory body designed to strengthen the National TB Programme (NTP). It fosters collaboration between government, researchers, civil society, funders, and technical partners through national oversight by the NTP Chief Director and the South African Medical Research Council Director in the Office of AIDS and TB Research. TBTT is supported by a dedicated secretariat and thematic technical task teams aligned with NTP priorities, which ensure sustainability through regular stakeholder engagements, policy dialogues and evidence dissemination. A rotating leadership model and multiple funding partners further enhance its viability.
Results/Impact: Over the past decade, TBTT has played a pivotal role in shaping national TB policy. Key contributions include the development of two national 5-year TB strategic plans, six clinical guidelines (including the 2024 update to the national child and adolescent TB guidelines), a post-COVID TB recovery plan, and guidance on the integration of new tools (e.g., urine LAM and digital chest X-ray).
TBTT has also expanded to over 300 members and established additional task teams to reflect emerging priorities, such as TB vaccine development.
Conclusions: The TBTT model demonstrates that structured collaboration can drive agile, evidence-based policy and programming in high-burden settings. Its success provides a scalable blueprint for other health programmes and countries, underscoring the importance of government buy-in, sustainable funding, and strong stakeholder engagement.

EP10-792-19 Comparative study of computer aided detection CXR AI threshold scores across TB diagnostic platforms in North Central Nigeria

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Background: Nigeria with the highest impact of TB in Africa reported its highest-ever people affected by TB in 2024 with over 400,000 cases, strategies like the gradual roll-out of four hundred (400) portable digital X-ray machines and integration of CXR (Chest X-ray) into the national TB screening algorithm helped achieve that.
This study compares CAD (Computer Aided Detection) CXR threshold scores with other TB diagnostic platforms.
Design/Methods: The Start Taking Action for TB Diagnostics (START4ALL) project conducted a cross-sectional survey in selected primary and secondary health facilities in Abuja and Nasarawa.
Blood, sputum, and urine samples, plus CXR scans, were collected from random consenting participants for various diagnostic tests for TB and HIV, including GeneXpert, culture, and Fujilam.
Results were analyzed using grouped AI threshold scores and chi-squared tests.
Results: A total of 1703 participants were recruited, with 1661 (97.5%) having a CXR scan done. Significant association was found between the grouped AI threshold scores and all diagnostic platforms used in the study (p-value <0.001). HIV status recorded a p-value of 0.007 against the grouped AI scores.
Interestingly, positive results in the lower score range (0.00 – 0.40) totalled 9.6% against GeneXpert, 31% against Fujilam, and 40.9% against Culture.

X-ray AI Scores		Overall	0.00 - 0.20	0.21 - 0.40	0.41 - 0.60	0.61 - 0.80	0.81 - 1.00	P- Value
Number of Participants		1661	1157 (69.7)	97 (5.8)	57 (3.4)	66 (4.0)	284 (17.1)	
HIV Status, n(%)	Negative	1414	1005 (71.1)	79 (5.6)	41 (2.9)	54 (3.8)	235 (16.6)	0.007*
	Positive	238	146 (61.4)	17 (7.1)	16 (6.7)	11 (4.6)	48 (20.2)	
MTB Status, n (%)	Mtb Not Detected	1463	1123 (76.7)	93 (6.4)	54 (3.7)	61 (4.2)	132 (9.0)	<0.001*
	Mtb Detected	156	12 (7.7)	3 (1.9)	2 (1.3)	3 (1.9)	136 (87.2)	
Fuji Lam, n (%)	Negative	1513	1114 (73.6)	92 (6.1)	53 (3.5)	63 (4.2)	191 (12.6)	<0.001*
	Positive	145	41 (28.2)	4 (2.8)	4 (2.8)	3 (2.1)	93 (64.1)	
Culture, n(%)	Negative	1358	997 (73.4)	76 (5.6)	48 (3.5)	63 (4.7)	174 (12.8)	<0.001*
	Positive	171	64 (37.4)	6 (3.5)	4 (2.3)	3 (1.8)	94 (55.0)	

N/B: Only 1568 culture results were available at the time of abstract submission.

Conclusions: High levels of association were observed amongst the threshold scores and diagnostic platforms with a substantial number of positive cases found across each score group. This study serves as further evidence in the push to recognize lower threshold scores when screening patients to avoid missing out on possible asymptomatic cases.

EP10-793-19 Chest X-ray AI scores guide pooled testing to increase access to rapid molecular testing for TB in communities in Cameroon

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Background: Despite WHO's recommendation for universal rapid molecular testing, only 48% of people newly diagnosed with TB in 2023 were tested with a rapid test. A major obstacle is the high cost of the tests. A high AI score on chest X-ray screening correlates with higher likelihood of TB, and pooled testing of specimens improves testing efficiency. Using AI score results to inform whether to use pooled testing has the potential to greatly increase access to TB testing,
Design/Methods: People attending health camps in northern Cameroon were screened for TB using chest X-rays and symptoms. People with an AI score suggestive of TB and/or two or more symptoms of TB were referred for a TB test and coached on sputum collection. Depending primarily on the AI score, sputum specimens were tested either individually (typically for AI score >0.9) or in pools of 2-8 on the TrueNat MTB Plus assay (Molbio, India). We evaluated the efficiency and accuracy of this approach.
Results: From July 2024 to March 2025, following chest X-ray screening, 2,183 sputum specimens were tested for TB using Truenat MTB Plus following AI-informed individual or pooled testing. Among 683 specimens tested individually, 105 (15.4%) had TB detected. Among 1,510 specimens tested in pools, 24 (1.6%) had TB detected. Testing was performed using a total of 1,204 molecular tests, for a testing efficiency of 0.55 tests used per person with a test result, saving 45% of cartridges. Additional analyses are ongoing.
Conclusions: By using chest X-ray AI scores to inform pooled testing, almost twice as many people benefited from a rapid molecular test result as compared if everyone had been tested individually.

EP10-794-19 AI-assisted chest radiograph analysis for TB screening in mobile diagnostic units: Experience from a High TB-burden country, India

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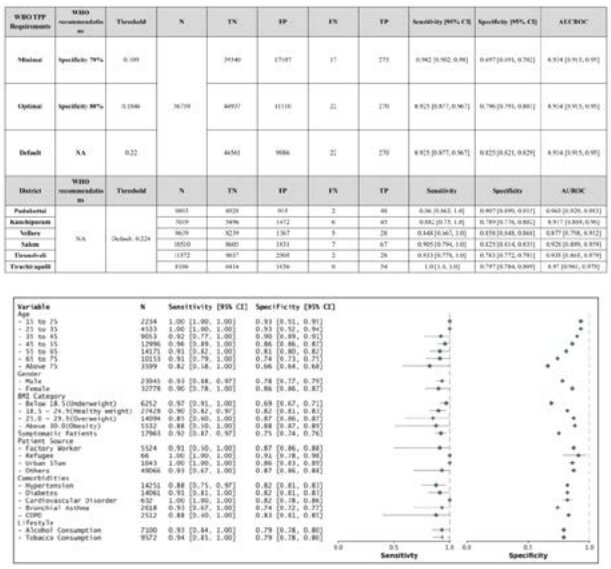
Background: Tuberculosis (TB) remains a global public health challenge, with detection often delayed by conventional screening methods. In Tamil Nadu, India, DeepTek's AI solution (GENKI) was integrated into the National TB Elimination Program (NTEP) via mobile X-ray vans to enhance detection rates through chest radiograph assessment.
This study aimed to assess GENKI's performance in community-based TB screening programs.
Design/Methods: GENKI analyzed chest X-rays to identify individuals who may have TB. Those flagged by the software or experiencing TB symptoms underwent sputum testing (smear microscopy/CBNAAT/TrueNat), which served as the reference standard. We evaluated GENKI's performance across different districts and demographic subgroups, including age, gender, co-morbidities, BMI category, lifestyle, and occupation.
Results: GENKI demonstrated an overall AUROC of 0.934, a sensitivity of 0.925, and a specificity of 0.828 at the deployed threshold. The model performs well across all age groups, with performance exceeding the WHO recommended optimal TPP in the 15-25 years (sensi-

tivity: 1.00, specificity: 0.93), 25-35 years (sensitivity: 1.00, specificity: 0.93), and 45-55 years (sensitivity: 0.96, specificity: 0.86) categories. For the 35-45 years (sensitivity: 0.92, specificity: 0.90), 55-65 years (sensitivity: 0.91, specificity: 0.81), and 65-75 years (sensitivity: 0.91, specificity: 0.74) age groups, the model meets the WHO-recommended minimal TPP threshold. The NPV values were exceptionally high (99.9%), ensuring reliable negative interpretations.



Conclusions: The AI model meets and, in some cohorts, exceeds the WHO's minimal TPP requirements, demonstrating its potential for effective integration into screening workflows for TB detection. The high AUROC across different demographic variables indicated the model's robust discriminative ability, reinforcing the potential of AI-assisted tools in large-scale TB screening programs.

EP10-795-19 Impact of mobile TB clinics with digital X-ray, CAD4TB, and Xpert MTB/RIF/Ultra on same-day TB diagnosis and treatment initiation: Insights from Uganda

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Background: Tuberculosis (TB) is a persistent public health challenge in Uganda, with a high TB incidence rate of 198 per 100,000 population, an annual estimated notification of 96,000, and significant case detection and treatment gaps. Limited access to diagnostic services in underserved communities exacerbates TB transmission and mortality.

As part of Uganda's National TB and Leprosy Strategic Plan (2020/21–2024/25) and the global End TB initiative, mobile TB clinics equipped with digital X-ray, CAD4TB, and Xpert MTB/RIF/Ultra technologies were deployed. This study evaluated the clinics' impact on same-day TB diagnosis and treatment initiation.

Design/Methods: A mixed-methods cross-sectional study was conducted from February to June 2024 across 70 high-risk communities identified based on notification data and healthcare access limitations. Individuals aged 15 years and above were targeted, excluding pregnant women and those unable to undergo chest X-rays. Using purposive and consecutive sampling, 288 TB patients were targeted for same-day diagnosis and treatment initiation, requiring 5,760 clients to be screened given a 5% prevalence rate (5,000/100,000). Data collection utilized Open Data Kit (ODK) based structured questionnaires, and X-ray quality was validated. CAD4TB's diagnostic accuracy was compared to Xpert MTB/RIF/Ultra as the reference standard. Feasibility and cost-effectiveness were also evaluated.

Results: The intervention achieved 100% screening uptake, with 5,760 clients screened, predominately aged 24 – 44 years, with females constituting 55.4%. 1,690 presumptive TB cases were identified, with 1,172 sputum samples collected and tested, diagnosing 109 TB patients (73% bacteriologically confirmed and 29% clinically diagnosed). CAD scores ≥ 50 demonstrated a diagnostic yield of 19.7%. Same-day treatment initiation reached 98%.

Parameter	Diagnostic Performance Metrics					Socio-demographic	
	Screened (CXR)	Tested (Xpert)	MTB Detected	Yield (%)	Same-Day Tx Initiation (%)	Highest Age Group Screened	
CAD Score ≥ 50	397	380	75	19.7	97	35–44 years	Male (44.6%), Female (55.4%)
CAD Score < 50	5,363	792	5	0.6	100	35–44 years	Male (44.6%), Female (55.4%)
Total	5,760	1,172	80	6.8	98	35–44 years	Male (44.6%), Female (55.4%)

Table: Diagnostic Performance Metrics of Mobile TB Clinics Equipped with CAD4TB and Xpert MTB/RIF/Ultra in Uganda.

Conclusions: Mobile TB clinics with advanced diagnostic technologies effectively bridged critical care gaps in Uganda. These clinics align with national and global TB strategies, providing a scalable and replicable model for resource-limited settings. Sustained investment and partnerships are vital for expanding equitable TB care.

EP10-796-19 Pairing artificial intelligence (AI) with WHO-recommended rapid molecular diagnostics (mWRDs) in community settings: Targeted screening and early diagnosis for improved tuberculosis (TB) notification

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Background and challenges to implementation: Ranking 6th amongst the Global High TB burden countries and 1st in Africa, Nigeria has taken measures towards the eradication of TB. However, due to the poor seeking health behaviour, it became imperative to decentralise TB screening and testing from facility-based to community-based screening and testing. KNCV Nigeria in collaboration with other partners introduced The Portable Digital Xray (PDX) with Computer Aided Detection (CAD), an AI equipment, a World Health Organisation (WHO) recommended tools for improved screening in both symptomatic and asymptomatic persons for increased TB case finding.
This was coupled with WHO rapid diagnostics (mWRDs) for sample analysis for onsite TB Diagnosis as a One-Stop-Shop approach. The study aims to evaluate the impact of this intervention on TB case finding.
Intervention or response: Implementation kicked-off with the coupling of 4 PDX (with CAD) and 4 mWRDs on Wellness on Keke (WOK), a KNCV mobile Innovative platform for Community ACF.
Screening was conducted using the WHO-4-symptoms-screening (W4SS) alongside PDX (with CAD). Samples were collected from clients whose radiographs had a screening score ≥50 and could produce sputum.
On-the-spot sample analysis was conducted using the coupled mWRDs in the communities and all positive TB Patients were immediately initiated on treatment.
Results/Impact: From Jan 2023 - December 2024, a total of 137,049 clients were screened for TB with 11,803 presumptive (9% presumptive TB yield) identified. 11,769 (99.7%) presumptive TB clients were evaluated, and 2359 TB cases were diagnosed (20% TB yield). 1754(74%) were bacteriologically diagnosed while 605(26%) were clinically diagnosed. All clients diagnosed were placed on treatment.
Conclusions: Coupling PDX (with CAD) and m-WRDs for C-ACF ensured no case was missed as clients were either diagnosed bacteriologically or clinically on the spot and initiated on treatment. Scale-up of PDX coupled with m-WRDs is key for targeted screening, diagnosis and treatment enrollment, ultimately increasing TB notification in Nigeria.

EP10-797-19 Monthly portable digital X-ray screening to combat tuberculosis burden in New Katsina Prison: A scalable model for prisons

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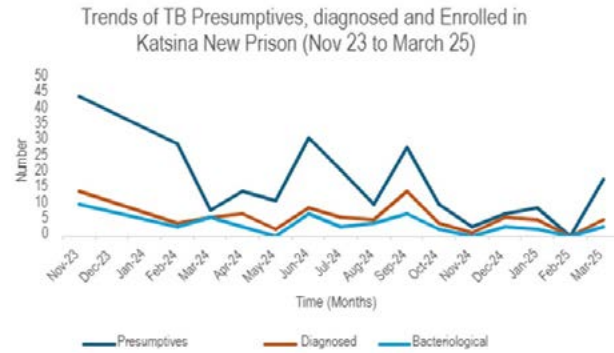
Background and challenges to implementation: Tuberculosis (TB) control in correctional facilities remains a significant public health challenge due to overcrowding, poor ventilation, and delayed diagnosis. The Katsina New Prison in Nigeria, housing a dynamic population of inmates and staff, had persistent TB transmission concerns. A novel monthly screening approach using portable digital X-ray (PDX) machines was implemented to curb ongoing and new infections.
We present a result showcasing screening efforts to combat the TB burden in the Katsina correctional facility.
Intervention or response: Beginning in 2023, a dedicated TB screening team visited Katsina New Prison monthly. Each visit followed the intake of new inmates. A PDX machine with an artificial intelligence software was deployed to screen both the inmates and staff using a parallel algorithm, with presumptives identified via symptom screening and or abnormal CXR findings undergoing GeneXpert testing for confirmation. Active case finding and immediate linkage to TB treatment were ensured.



Results/Impact: From November 2023 to March 2025, 2,307 individuals were screened across 17 monthly visits. A total of 259 presumptive TB cases were identified via PDX, of which 90 were confirmed TB-positive through GeneXpert. This represents a TB detection rate of 35%. Notably, the presumptive and case detection continue to decline month by month, with some spikes noted in March when activity was skipped in February due to a stop work order. There was no significant outbreak or cluster of new infections recorded during the period, sug-

gesting an interruption of active transmission. Clients' compliance with screening remained above 90%, and repeat screenings helped identify late converters and monitor treatment response.
Conclusions: Monthly PDX-driven TB screening in Katsina New Prison significantly enhanced early detection and likely halted intra-facility transmission. This approach proved feasible, acceptable, and effective, presenting a scalable model for TB control in correctional settings globally.

EP10-798-19 Evaluating diagnostic yield of a numeric CAD score to triage mWRD negative patients for repeat mWRD testing in a rural Indian ACF programme

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Background: Tuberculosis Active case finding (ACF) is a key programmatic component in India's TB eliminations strategy. Targeted mobile digital radiology to triage candidates for confirmatory testing using mWRD assay is a well-established ACF strategy. CAD (computer aided detection) software has been demonstrated to outperform human readers and reduce mWRD cartridge use by 50% with cost savings. CAD is now recommended by WHO as an alternative to human readers. Nested in a ACF cluster RCT in district Karnal (India), we undertook a novel evaluation using numeric CAD cut-offs to triage mWRD negative TB suspects for a second assay.
Design/Methods: Symptomatic individuals identified through door-to-door screening were referred to local health subcenters for digital X-ray on a mobile van. X-rays scored at >0.6 using QURE.AI CAD underwent mWRD testing. A second assay was performed on WRD negative suspect cases able to provide sputum within 4 weeks.

CXR-AI scoring	First mWRD assay Positive	First mWRD assay negative	Second mWRD assay positive	Second mWRD assay negative
0.6-0.69	4	123		58
0.7-0.79	7	128		66
0.8-0.89	17	196		99
0.9-1.00	181	600	13	283
Total	209	1047	13	506

Table 1: Diagnostic yield of 1st and 2nd WRD assay by QureAI CAD cut-offs

Results: Of 6,408 suspected cases were X-rayed,1,369 had a CAD score of >0.6. 1,256 underwent mWRD testing of who 209 (17%) were positive. Of the 1,047 mWRD negative suspected cases, 519 could be located within 4 weeks and provide a voluntary specimen for repeat mWRD assay, of who 13 (2.5%) were positive and 506 negative. All 13 mWRD positive cases had a CAD score of >0.9.
Conclusions: Our novel findings demonstrate that increasing CAD cut-offs is potentially an effective approach to triage suspected cases who are negative on a first mWRD assay. Limiting repeat mWRD assay to only suspected cases with a CAD score of >0.9 could potentially reduce the use of cartridges by 43% without any significant loss in diagnostic yield. Optimising the efficiency and cost effectiveness of ACF strategies is a key research priority to accelerate TB elimination.

EP11 From mines to clinics, securing lung health in high-risk occupations

EP11-799-19 From awareness to action: Workplace initiative for TB screening and care

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Background and challenges to implementation: Uganda faces a significant tuberculosis burden, with high incidence rates reported by the World Health Organisation. In 2024, the country reported 88,869 TB patients, an increase from 87,876 in 2023. To control the spread of the disease and mitigate its impact, the Office of the Prime Minister launched the Multi-Sectoral Accountability Framework for TB in 2020, directing Ministries, Departments, and Agencies to integrate TB prevention and control interventions into their Programme Implementation Action Plans to disrupt TB transmission and enhance early detection of the disease.
Intervention or response: In response to OPM's call to integrate tuberculosis interventions into PIAPs, in November 2023, Internal Security Organisation (ISO) launched a comprehensive initiative focused on tuberculosis awareness, screening, and testing, aimed at combating and disrupting the transmission chain of tuberculosis among its workforce.
The initiative aimed to improve employees' understanding of TB, reduce stigma, correct misconceptions about transmission, and enhance access to tuberculosis care services. 12 capacity-building sessions were conducted across 12 regions. 362 ISO employees in Kampala Metropolitan area participated in a week-long health camp organised at the ISO headquarters. The camp was facilitated by the Ministry of Health, which provided a TB mobile clinic van to deliver TB care services and linked identified patients to healthcare services.
Results/Impact: Increased awareness of tuberculosis prevention and control measures among 367 employees. 4 TB patients were identified and referred for care from 267 presumptive out of 367 employees screened. A positivity rate of 1.49%, which is considerably higher than the national average of 0.198%. All patients received timely medical interventions and social support as outlined by the ISO TB-HIV workplace policy.
Conclusions: ISO's workplace tuberculosis awareness initiative has enhanced employee health outcomes by tackling stigma and misinformation barriers, promoting early detection and treatment, and serves as a model for other organisations to replicate.

EP11-800-19 Epidemiology and statistical analysis of occupational health risks: Implications for workplace safety and worker well-being

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Background: Occupational health refers to the prevention, diagnosis, and management of health conditions that arise from or are aggravated by workplace environments. With the global workforce increasingly exposed to diverse physical, chemical, and psychological risks, understanding the epidemiology of workplace health is crucial for effective interventions.
Given the significance of occupational health in preventing long-term health conditions and ensuring the well-being of employees, a systematic review of workplace risks is necessary to inform policy, improve safety.
Design/Methods: This study employed a systematic review and meta-analysis of epidemiological data to evaluate workplace health risks across various industries. Studies published between 2000 and 2024 were included, focusing on both physical and psychosocial hazards.
A statistical approach was used to calculate the prevalence of occupational diseases, identify risk factors, and examine the correlation between exposure and health outcomes using relative risks, odds ratios, and confidence interval.
Results: The results highlighted that approximately 35% of workers in high-risk industries experienced work-related health conditions, with musculoskeletal disorders accounting for the largest percentage (42%).
Additionally, mental health issues, particularly stress, were found to be disproportionately high in service-oriented sectors. The meta-analysis indicated a strong correlation between exposure to hazardous environments and increased incidence of chronic diseases. Statistical modeling suggested that improving ergonomic practices and reducing exposure to environmental toxins could reduce the prevalence of these diseases by up to 20%.
Conclusions: This study underscores the need for comprehensive occupational health policies that focus on both physical and mental health risks. The findings emphasize the importance of regular workplace health assessments and the implementation of preventive measures.
Addressing ergonomic issues, enhancing air quality, and promoting mental well-being programs are essential steps to mitigate the health impacts of work-related exposures. Ultimately, a proactive approach to occupational health can not only improve worker health but also reduce the economic costs of workplace illnesses.

EP11-801-19 TB among healthcare workers in Zambia: A trend analysis 2018-2022

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Background: Tuberculosis (TB) remains a significant occupational hazard for healthcare workers globally. In Zambia, the burden of TB among healthcare workers (HCWs) has not been well characterized. This study aimed to analyze trends in TB among health workers and associated risk factors.
Design/Methods: We analyzed TB surveillance data from 597 healthcare workers diagnosed with TB between 2018-2022. Using negative binomial regression, we first conducted bivariate analyses for each potential predictor variable. Variables with $p<0.2$ in bivariate analyses (year, sex, TB type, patient category, and province) were included in the final multivariate model, while HIV status was excluded as it did not meet the threshold significance level. We assessed trends in TB cases and identified associated risk factors.
Results: The were a total of 597 cases of TB notified between 2018 and 2022 among HCWs. Most affected were in the 30-49 age group. The were more females 316(53%) than males 281(47%).
The annual number of TB cases among healthcare workers increased by 23.95% per year (95% CI: 15.22% to 33.35%) after adjusting for patient category and province. Most cases were pulmonary TB (71.2% clinically diagnosed; 21.3% bacteriologically confirmed), and 40% of HCWs were HIV-positive.
New TB cases predominated (88.5%) compared to relapse cases (11.3%), with relapse cases showing significantly lower incidence (IRR=0.49, $p<0.001$).
Healthcare workers in Lusaka (IRR=2.22, $p<0.001$) and Copperbelt (IRR=1.55, $p=0.027$) provinces had significantly higher TB rates compared to Central province. (59.2%).
Conclusions: The yearly increase in TB among healthcare workers in Zambia indicates a growing occupational health crisis requiring urgent intervention. With the increasing TB incidence among HCWs, healthcare facilities should prioritize implementation of TB infection prevention and control strategies, regular screening of healthcare workers, and prompt initiation of preventive therapy.
These findings underscore the critical need for enhanced occupational protection policies to safeguard the health workforce.

EP11-803-19 Impactful collaborations: Multi-sector engagement and accountability for TB free workplace in a mining predominant district of Karnataka, India

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Background and challenges to implementation: NTEP India is exploring and engaging for collaboration and partnership with potential non-health sectors for elimination of TB. The India TB Report 2024 underscores that 85% of notified TB occurs within the age group of 20 to 60 years. As per Periodic Labour Force Survey 2023, Karnataka's working population ratio is 34 million (46%), with 15% organized and 85% unorganized workers. They are supported by 42-line departments within the state. In response, this study aimed to improve TB service accessibility and affordability through targeted screening at mining workplaces, bolstered by enhanced resources and multi-department collaboration.
Intervention or response: Interventional study, focusing on engaging two key departments—the Department of Factories, Industrial Safety and Health, and the Department of Mines and Geology to address TB among those associated with iron mining in Bellary district, Karnataka. This involved high-level advocacy meetings, development of SoPs, sensitizing workplace establishments, screening at workplaces, and resource mobilization to augment laboratory testing through upfront NAAT (Nucleic Acid Amplification Test).
Results/Impact: Of the 207 workplace establishments, 66 (32%) were sensitized. Among them, six major industries initiated regular TB screening for their workers. All Occupational Health Centres were registered in Ni-kshay (national case-based, web-based surveillance system). This facilitated in enrolling 788 TB presumptive and, 27 PwTB received ongoing follow-up within these establishments. Notably, funding amounting to INR 30 million was secured from the District Mineral Fund to install three GeneXpert machines and fourteen Truenat machine, increasing capacity for upfront NAAT from 18000 to 52500 tests per million population.
Conclusions: This model demonstrates collaboration among departments, resource mobilization, leading to successful TB screening and care cascade at workplace addressing the gaps in routine systems may be one of the game-changers in TB elimination.

EP11-804-19 Artisanal and small-scale miners' perceptions on targeted TB and occupational health screening programme in Zimbabwe

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Background: Artisanal and small-scale miners (ASM) face a high burden of disease—including TB, HIV, silicosis, sexually transmitted infections, substance misuse, and exposure to mercury and cyanide toxicity. Despite growing awareness, healthcare interventions tailored for this group remain limited.
Design/Methods: We explored the perceptions of ASM and their representatives regarding a five-year screening intervention in Zimbabwe (KNTB). Using focus group discussions, we gathered insights from 31 participants, including ASM, ASM leaders/representatives, healthcare staff, academics, and national stakeholders.
Results: Participants unanimously agreed that screening activity was highly beneficial. However, fears surrounding the screening process and the potential for positive TB or HIV results were evident. To address these concerns, participants stressed the importance of sensitisation initiatives led by ASM leadership and peer-officers. Stigma was identified as a factor that reduced HIV testing uptake relative to TB testing.
Additionally, traditional beliefs and religious practices significantly influenced health-seeking behaviour, with many ASM believing that diseases including silicosis were easily treatable with simple measures e.g "staying out of dust for a week" or "drinking milk". For TB diagnosis, challenges centred on diagnostic results not being available on the same day.
For those requiring treatment for HIV, maintaining continuity of care was a significant challenge due to the mobile nature of their occupation and access to transportation. Treatment adherence was further complicated by ASM "feeling well" after initial treatment doses, unaware of the consequences of not completing courses. Further themes are summarised in Figure 1.

Figure 1.Diagram summarising themes and sub-themes from focused group discussions with 31 participants.

Conclusions: There is a critical need for targeted health screening and comprehensive care for this vulnerable group. Whilst the KNTB model showed considerable promise, expanding such interventions to reach ASMs in other regions and addressing additional health priorities will require enhanced collaboration between the mining sector, the Ministry of Health, and other stakeholders.

EP11-805-19 Effectiveness of TB treatment in individuals exposed to silica or with silicosis: A systematic review

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Background: Tuberculosis is a global problem affecting large numbers of silica-exposed workers. Both silica exposure and silicosis increase the risk of active tuberculosis. Some studies have suggested that silica exposure and silicosis are associated with unsuccessful TB treatment outcomes and increased relapse. Current evidence is based on a mix of clinical trials and observational studies with inconsistent results.
This systematic review aimed to examine the potential modifying effect of silica exposure alone or of silicosis on TB treatment outcomes.
Design/Methods: We conducted a systematic review of randomized and nonrandomized controlled trials, cohort and case-control designs published 1970-2023. Eligible studies investigated outcomes among silica-exposed individuals or (separately) those with silicosis receiving

TB treatment. We searched PubMed, Web of Science and Scopus on 10-03-2024. We conducted risk of bias (ROB) assessments appropriate to study design: 1) ROB In Non-Randomized Studies – of Intervention (ROBINS-I), 2) ROB In Non-Randomized Studies – of Exposures (ROBINS-E) and 3) ROB tool for randomized trials (RoB 2).
Results: Six studies met the inclusion criteria, all involving individuals with silicosis. The pooled odds ratio (OR) for treatment failure/delayed conversion for individuals with silicotuberculosis versus those with TB alone was 2.86 (95% CI: 1.73-4.74; N=3), the corresponding estimate for mortality OR: 2.45 (95% CI: 0.58-10.39; N=2), and for TB relapse OR: 1.19 (95% CI: 0.01-135.53; N=2). High risk of bias or "some concerns" were noted in five of the six studies, due to possible confounding, loss to follow up, missing data, and/or concerns about exposure or outcome measurement.
Conclusions: The evidence base on treatment outcomes in silicosis is sparse and suffers from high risk of bias. However, the direction is towards significantly poorer outcomes than for TB alone. Randomised or high-quality follow-up studies are long overdue to strengthen the evidence base for this neglected question.

EP11-806-19 Reaching behind bars: Mobile TB van initiative for central region district prison TB eradication in Malawi

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Background and challenges to implementation: Tuberculosis prevalence is very high in prisons due to several factors like congestion and poor nutrition. This poses significant a public health risks. Central region district prisons face unique challenges in TB diagnosis, treatment and prevention due to resource constraits and overcrowing. The studying districts are nkhotakota prison and Kasungu prison district prisons.
The objective is to evaluate the impact of a Mobile TB Van on TB screening and detection among inmates in central region prison districts.
Intervention or response: A mobile TB Van equipped with digital Chest –Ray GeneXpert and other diagnostic tools , visit the prisons every six months for mass TB screening . All the prisoners undergo Chest X Ray despite no sign. Those with symptoms or those having high CAD score submit sputum for geneXpert.
Those diagnosed with TB are initiated TB treatment, care, follow up and education.
Results/Impact: During the year 2024 we screened 994 prisoners 69 presumptives (6.9%) and 7 TB cases (10%) of the presumptives. We had screened 23 prison staff with no presumptives.
Conclusions: The Mobile TB van significantly improved TB screening and detection among inmates in central region prison districts of Kasungu and Nkhotakota. This innovative approach can be replicated in other prison settings to reduce the burden of TB and improve health outcomes among this vulnerable population.

EP11-808-19 Radiation protection and safety of end users of the portable digital X-ray (PDX) machines for TB screening in Nigeria: Experience of KNCV Nigeria

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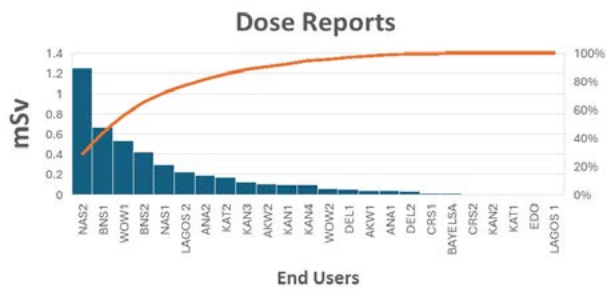
Background and challenges to implementation: Radiation safety is a concern for all, radiation from diagnostic imaging modalities such as Xray machines are minor contributors to the cumulative dose exposures of healthcare personnel. However, frequent ionizing radiation exposure during TB screening with PDX may be a potential risk of serious illnesses and death if safety measures are neglected.
Intervention or response: KNCV Nigeria supported the deployment of PDX platforms for TB screening, and engaged radiographers dispensing ionizing radiation on average, screen above 50 persons daily. Although radiation emission of PDX is low compared to conventional Xray machines, KNCV Nigeria provided regular retraining of all the end users, mandates wearing of TLD badges under the lead apron and ensured that all radiographers wear appropriate PPE and use the exposure strings provided by the manufacturers **(Delft, MinXray and Fuji)**. Reading from the TLD is obtained every quarter and recorded as a monitoring measure for all end users.



Results/Impact: For employee of 18 years or above, the dose limit for the whole body is 100mSv over five consecutive years and no one year must exceed 50mSv. We

obtained and analysed the dosimeter report for 4 consecutive quarters, the highest accumulated dose was 1.25mSv against annual limit of 20mSv. This result was achieved through multiple approach ranging from equipment design, training and compliance with radiation safety enforced on all end users by KNCV.

Conclusions: The combination of multiple approach ranging from retraining of end users on safety, fidelity to manufacturers instructions and use of exposure strings along with enforcing the use of protective devices has ensured the safety of all the end users of the PDX machines, hence the dose measurement over one calendar year has remained negligeable. The use of PDX for TB screening should be encouraged as it contributes close to zero risk to the end users.

EP12 Leveraging AI across the TB care cascade: From hotspot detection to treatment success

EP12-809-19 Leveraging eCBSS data for geospatial mapping of TB hotspots and optimising the integrated TB case finding (CAST+) intervention in Eastern Uganda

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Background and challenges to implementation: The Ugandan Ministry of Health developed the CAST+ strategy to find missing TB patients through 5-day biannual door to door community screening for TB, leprosy, HIV, malaria, malnutrition, antenatal care and immunization status. The first nationwide campaign was conducted September 2022, covering all villages.

However, this intervention has proven costly with variable results. In 2020, Uganda adopted the electronic case-based surveillance system (eCBSS) for TB surveillance and program reporting that provides patient level data and place of residence.

We describe how eCBSS data was used to develop geospatial maps to define TB hotspots for targeted CAST+ Campaigns.

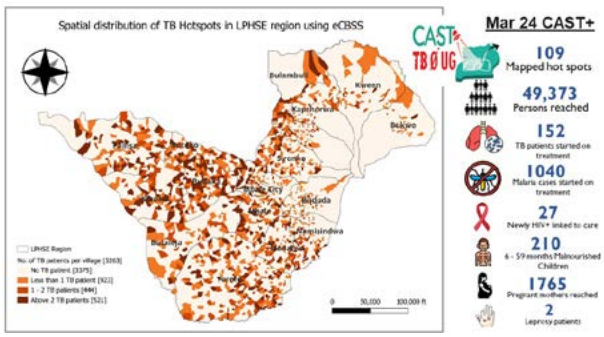
Intervention or response: Prior to the CAST+ campaign in March 2024, USAID LPHS-E scaled up eCBSS to 93% (166 out of 178) of the Diagnostic and Treatment Units (DTUs) in the Bukedi and Bugisu regions and supported entry to 103% (6992 out of 6860) of the patient backlog.

This data was then used to map TB hotspots using Geographic Information System technology, which were prioritized and actively screened during the CAST+ campaign in March 2024.

A hotspot was defined as any village with more than two TB patients in the past year (March 2023 to February 2024).

Results/Impact:

- There was a 41% drop in unit cost of identifying a TB patient from $66 in September 2022 to $37 in March 2024.
- The March 2024 campaign cost $5,783, a significant reduction from the $50,678 spent in the September 2022 campaign.
- During the March 2024 CAST+ campaign, 155 TB patient from the 109 mapped hotspots were diagnosed and started on treatment, compared to 764 TB patients identified in all villages in Sept 2022 with similar yield of 2.0% and 1.9% respectively.



Conclusions: Utilizing eCBSS data for geospatial mapping enables TB programs to accurately identify hotspots, pinpoint high-burden areas, and effectively guide resource allocation for targeted community TB interventions.

EP12-810-19 AI-powered vulnerability mapping for TB as a guiding tool for active case-finding activities

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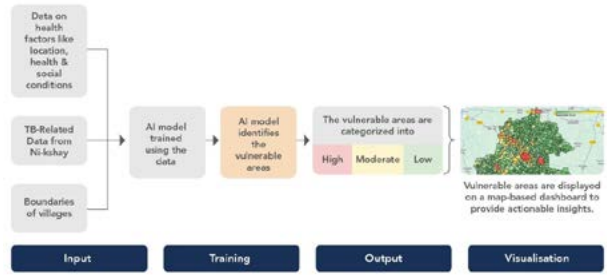
Background and challenges to implementation: India's National Tuberculosis Elimination Programme (NTEP) deploys Active Case Finding (ACF) to systematically screen at-risk vulnerable populations, aiming for early Tuberculosis (TB) identification and reduced transmission.

Traditionally, mapping areas with these populations relies heavily on the local knowledge of healthcare staff. Consequently, despite NTEP's intensified efforts to screen all the at-risk vulnerable individuals, unreported Persons with TB (PwTB) might be missed if they reside in areas not covered during ACF activities, thus continuing disease transmission. To support NTEP's ongoing intensified efforts, an innovative AI tool has been developed to identify areas likely harboring undiagnosed individuals, aiming to enhance ACF outcomes.

Intervention or response: Wadhwani AI has developed a novel AI-based vulnerability mapping tool. It integrates over 20 open-source datasets encompassing geographical, socio-demographic, and economic factors with anonymized PwTB location coordinates from Ni-kshay portal (a web-based, case-based real-time surveillance system under NTEP). To ensure accuracy, a data pipeline was developed to standardise and perform necessary transformations to make these datasets usable at varied resolutions. The AI model generates vulnerability predictions at a highly granular 500x500 meter tile level. These are then aggregated to the village/ward level, providing actionable insights compatible with NTEP's operational structure.



Results/Impact: The developed AI tool utilises more than 11.6 million geospatial tiles to provide village/ward-level vulnerability for all districts nationwide. To validate the tool's effectiveness, a retrospective analysis compared village rankings generated by the AI tool to the PwTB reported in the villages. It yielded 71% accuracy in identifying the top 20% of vulnerable villages (in descending order of PwTB notified) within the selected dataset.

Conclusions: The AI tool's initial model and technical infrastructure provide a promising foundation for supporting NTEP's ACF activities in the early detection of PwTB. Furthermore, the underlying methodology holds potential for adaptation for other infectious diseases.

EP12-811-19 Effectiveness of systematic screening of TB amongst key vulnerable populations using AI-enabled X-ray machines in Lagos State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) is a significant public health challenge in Nigeria, particularly among vulnerable populations. Traditional screening methods are often limited by resource constraints, leading to delayed diagnosis and increased transmission.

The integration of Artificial Intelligence (AI) into TB active case finding through mobile X-ray systems offers a promising solution to enhance early detection and treatment outcomes.

This study aims to evaluate the effectiveness of systematic screening using AI-enabled mobile X-ray machines on TB detection rates among key vulnerable populations in Lagos State, Nigeria.

Intervention or response: A comparative cross-sectional study was conducted amongst Key vulnerable population (prisoners) in Lagos State. The outcome of screening activities done using CAD4TB AI-enabled mobile X-ray machines were compared with screening done using the WHO-recommended four-symptom screen (W4SS), from June to December 2023.

The CAD4TB software is designed to detect TB-related anomalies in chest X-rays, providing real-time diagnostic support to healthcare providers.

Data on TB presumptives, detection rates, treatment initiation rate, and patient demographics were collected and analyzed.

Results/Impact: Of the 1,750 people screened, 625 were screened using A.I enabled mobile X-ray device, with 32 TB presumptives and 24 TB cases. The other 1,123 people were screened verbally using W4SS of which 230 were identified as TB presumptive and 13 cases bacteriologically diagnosed.

Mode of Screening	# Screened	# Presumptive	#Presumptive Evaluated	#TB Diagnosed	NNS	NNT
AI – enabled screening	625	32	32	24	26	1
W4SS Screening	1,123	230	230	13	86	18
Total	1,750	262	262	37	47	7

Conclusions: Systematic screening using AI-enabled X-ray machines significantly improved early TB detection and treatment initiation rates amongst key vulnerable populations. AI-enabled Chest X-ray machines in active TB case findingis an effective approach to reducing TB burden. Efforts should focus on deploying digitalized A.I-enabled X-ray machines to high burden settings, especially amongst key vulnerable populations.

EP12-812-19 Leveraging AI to enhance TB detection among asymptomatic individuals: A comparative analysis from community screening in Ladakh, India

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Background and challenges to implementation: Tuberculosis (TB) screening under national programs often relies on symptom-based screening, potentially missing cases in asymptomatic individuals. Artificial Intelligence (AI) tools offer a novel opportunity to augment TB detection by identifying individuals with atypical chest x-ray (CXR) presentations.

This study evaluates the effectiveness of an AI solution in detecting TB among asymptomatic individuals during a community-based screening.

Intervention or response: An AI-assisted CXR screening tool was deployed from July 2024 to March 2025 in Leh, Ladakh. A comprehensive schedule for area-specific screening activities was developed and disseminated to peripheral healthcare facilities. Community health workers conducted prior community sensitization and awareness campaigns.

All individuals aged 14 years and above were systematically screened, regardless of symptomatic presentation. Sputum samples were collected from individuals with symptoms as well as those identified with abnormalities on CXR flagged by AI-tool.

Results/Impact: Out of 10,209 individuals screened, 458 were detected with symptoms, while 47 asymptomatic individuals (0.5%) were flagged by AI-tool for abnormal CXR findings. Sputum samples were collected from 451 (98%) symptomatic individuals and 44 (94%) AI-identified individuals for nucleic acid amplification test (NAAT) confirmation. Among symptomatic individuals, 20 out of 451 (4.4%) were found positive for TB. Among AI-identified asymptomatic, 2 out of 44 (4.5%) tested positive for TB *(Table 1)*. Statistical analysis using Fisher's Exact Test showed no significant difference in TB positivity rates between two groups ($p \approx 1.00$). This indicates that the AI-tool identified TB-positive cases at a rate comparable to conventional symptom-based screening.

Table 1. Community- Level TB screening activity profile - Leh, Ladakh, India

Indicators	N	(%)
Total population	135232	
Total screened	10209	7.5%
TB symptomatic	458	
Sputum testing among symptomatic	451	
TB positive among symptomatic	**20**	**4.4%**
TB asymptomatic (flagged by AI as symptomatic)	47	0.5%
Sputum testing done among asymptomatic flagged by AI	44	
TB positive among asymptomatic	**2**	**4.3%**

Conclusions: The AI-assisted tool demonstrated a promising ability to detect TB among asymptomatic individuals at a rate equivalent to symptomatic screening. Reinforcing its potential as a valuable adjunct to routine TB screening, particularly for early detection in asymptomatic cases. Integrating AI tools into community TB screening activity may improve case detection and support TB elimination efforts by expanding reach of effective screening.

EP12-813-19 Using artificial intelligence software to improve TB screening efficiency: Comparison between intensified case finding in public facilities and the wow interventions in Kano State, Nigeria

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Background and challenges to implementation: AI-based CAD tools like CAD4TB improve TB screening efficiency in high-burden areas like Kano, Nigeria. This study assesses CAD4TB's role in reducing GeneXpert wastage by accurately identifying presumptive TB cases in ICF and WoW interventions.
Intervention or response: KNCV Nigeria's TB LON 1&2 project operates in 14 states, with two key interventions in Kano to find missing TB cases:
1. Facility-based screening (ICF) using trained ad-hoc staff, and;
2. Mobile community-based testing (WoW). Results from January–December 2021 were analyzed to compare their effectiveness.
Results/Impact: In 2021, the WoW intervention screened 40,681 people, diagnosing 727 TB cases, while ICF in public screened 1,122,066, diagnosing 5,847. WoW's AI-driven triaging showed a 4.7x higher yield, indicating greater efficiency by reducing unnecessary tests compared to ICF in public. This highlights WoW's precision in TB detection.
Conclusions: CAD4TB AI improves TB screening cost-efficiency by reducing false positives and cartridge waste. WoW's higher detection highlights AI's value in resource-limited settings like Nigeria, advocating for AI scale-up to optimize yield and cut costs.

EP12-814-19 Impactful use of handheld X-ray device for reaching the unreached population of tribal district Nandurbar in Maharashtra, India

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Background and challenges to implementation: To accelerate the effort in achieving the End TB targets for India new technological advancements are playing a pivotal role. The usage of new tool of Handheld X ray (HHX) devices in TB screening has expedited the progress in TB Elimination strategies for Nandurbar district of Maharashtra. It is a tribal district with limited access to health services which makes it extremely challenging for people to reach health facility.
Intervention or response: This cross-sectional study involved conducting 113 TB screening camps over a four-month period (December-2024 to March-2025) across the district in different villages. Two HHX machines were deployed to facilitate doorstep screening, particularly targeting vulnerable populations. Digital X-rays were remotely interpreted by radiologists through a secure digital transfer system. Individuals with abnormal chest X-rays were further evaluated using NAAT (Nucleic Acid Amplification Testing) to confirm TB diagnosis.
Results/Impact: As part of the intervention, 8592 chest X-rays were offered using handheld X-ray (HHX) devices across 113 screening camps. The initiative contributed to a notable increase in TB case notification rates—from 75/lac/year during Dec 2023–Mar 2024 to 114/lac/year during Dec 2024–Mar 2025—representing a 52% rise in

public sector TB notifications. The increase in TB notification is **statistically significant** ($p< 0.05$). This indicates that the observed rise is attributed to the effectiveness of the intervention. This included an additional yield of 224 TB cases compared to the same period in the previous year.

The screening also facilitated early detection of two malignancies and several other respiratory conditions, underscoring the broader diagnostic value of the intervention.

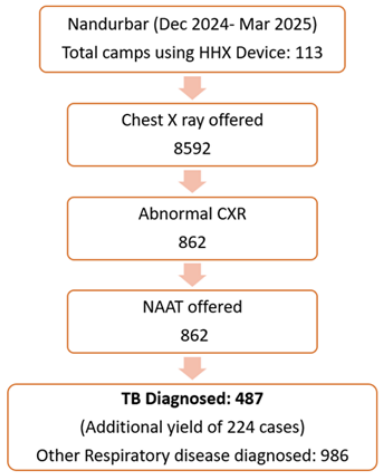

Figure 1. Nandurbar district TB screening camp Dec 2024 - Mar 2025.

Conclusions: The use of HHX machines among vulnerable populations significantly enhanced early TB case detection, resulting in a substantial additional yield and contributing to a statistically significant increase in notification rates. The portability of the device proved critical in reaching remote and underserved areas, improving healthcare access.

EP12-815-19 Bridging diagnostic gaps in rural Nigeria: The role of AI-supported PDX-CAD in TB detection

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Background and challenges to implementation: Tuberculosis remains a serious health issue in Nigeria, especially in rural areas with limited healthcare access. To tackle this, the TB LON project and STOP-TB Partnership introduced the AI-powered PDX-CAD machine for faster, more accurate diagnosis.

Despite challenges like tough terrain, power issues, and training needs, the team's dedication is paying off. This innovative tool is now bringing life-saving TB testing to hard-to-reach communities and helping close long-standing gaps in care.

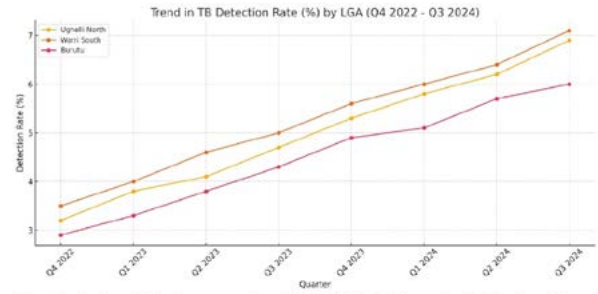
Intervention or response: A mixed-methods approach was adopted to assess the implementation, challenges, and impact of the AI-supported PDX-CAD system in improving tuberculosis detection in underserved rural areas of Nigeria. It focused on selected rural communities across three high-burden rural LGAs (Ughelli North, Warri South and Burutu) in Delta state, Nigeria where the PDX-CAD was deployed. These sites were chosen based on TB burden and accessibility.

Quantitative data were collected retrospectively from project registers between September 2022 and September 2024. Key indicators included the number screened, presumptive identified, and TB cases confirmed using PDX-CAD.

Qualitatively, Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) were also conducted with community members, including TB patients and caregivers, to provide insight into community level acceptance, awareness, and access to TB screening services.

Results/Impact: Analysis of 26 KIIs and 9 FGDs identified key themes. Barriers included unreliable electricity, internet issues, staff resistance to AI tools, and logistical difficulties. While strong community health worker involvement, hands-on support, and integration with TB programs helped things run smoothly. Users reported faster, more accurate TB diagnosis. Community members appreciated convenience and speed. Recommendations for scale-up include expanding training for frontline workers, and conducting community sensitization to promote early care-seeking and treatment initiation.

Trend analysis was conducted to evaluate changes in TB detection rates. Between September 2022 and September 2024, 18,476 individuals were screened and 1,215 (14.8% of screened) Presumptive identified. Analysis showed increase in the number of confirmed TB cases over the two-year period, particularly in the first 12 months. Detection rates improved from 4.2% in Q4 2022 to 7.6% in Q3 2024, indicating increased case finding and possibly improved awareness and access to screening.



Warri South shows the highest upward trend, Ughelli North follows closely behind and Burutu, while improving, lags slightly, reflecting infrastructure and accessibility challenges.

Conclusions: AI-supported PDX-CAD has significantly enhanced TB detection in rural Nigeria. Scaling up this innovation, alongside infrastructure improvements and community engagement can transform early diagnosis and save more lives.

EP12-816-19 Evaluating diagnostic accuracy and cost-effectiveness of AI-based CAD (QURE) for TB screening in Guinea

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Background and challenges to implementation: In Guinea, tuberculosis (TB) screening with chest X-rays (CXR) is often inaccessible due to few trained radiologists. Thus, direct microbiologic testing is common for people with TB symptoms. AI-driven computer-aided detection (CAD) tools may overcome access barriers to CXR in Guinea and help triage individuals for microbiologic testing. We assessed the diagnostic accuracy of CAD and cost-effectiveness of implementing CAD-based triage of symptomatic individuals compared to universal GeneXpert testing in Guinea.

Intervention or response: Individuals with TB symptoms who presented to 16 sites in Conakry, Guinea between 1 May and 31 October 2024 received CXR and GeneXpert testing. We compared the diagnostic performance of CAD (QureAI) to GeneXpert using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) overall and by subgroups (age, sex, and HIV status). Receiver operating characteristic (ROC) analysis was used to calibrate CAD scores, and Youden's Index to identify an optimal threshold. The cost-effectiveness of CAD-based triage (GeneXpert if CAD-positive) compared to universal GeneXpert testing was estimated.

Results/Impact: Among 1,095 participants screened, 167 (15.3%) had TB according to GeneXpert. CAD achieved an AUC of 0.96 (95% CI: 0.94–0.98) at an optimized threshold of 0.405, with an overall sensitivity of 88%, specificity of 92%, PPV of 67%, and NPV of 98%. Sensitivity was highest among females and those under 30 years, and reached 100% for people with HIV; specificity was ~92% across all subgroups. In this cohort, CAD-based triage would save $11,100 but miss 20 people with TB compared to universal GeneXpert. Thus, the incremental cost per additional TB diagnosis with universal GeneXpert was $555.

Conclusions: CAD has good diagnostic accuracy and has potential as a triage test in Guinea. CAD-based triage would save money compared to universal GeneXpert, but at the expense of missing TB diagnoses; its cost-effectiveness will be influenced by TB prevalence.

EP12-817-19 Using AI to improve reported treatment adherence under the National TB Elimination Programme (NTEP) in India

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Background and challenges to implementation: Under the National Tuberculosis Elimination Programme (NTEP), all persons with tuberculosis (PwTB) are issued a 'Treatment card,' a paper-based recording form available at health facilities (public/private). These cards document services like administered drugs (fixed-dose combinations), diagnostics, co-morbidities, treatment adherence, and treatment outcomes.

While field-level treatment supporters and healthcare workers manually update treatment adherence on these cards using coded symbols as per standard formats, digitizing this adherence data in real-time into the Ni-kshay portal (a web-based, case-based real-time surveillance system under NTEP) faces challenges.

Furthermore, existing patient-centric digital adherence tools suffer from variable uptake and engagement issues, especially during later treatment phases, leading to underreporting of adherence information on Ni-kshay.

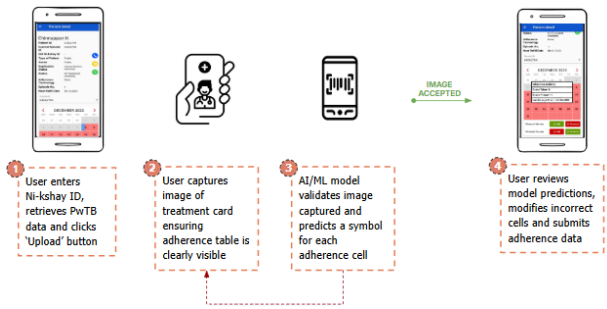
Intervention or response: To address this, Wadhwani AI developed an AI-powered tool for healthcare workers. This tool interprets the symbols marked on the Treatment cards to streamline adherence reporting. Healthcare workers can periodically upload smartphone images of the cards.

The AI tool then validates the image, identifies the symbols to interpret, and calculates cumulative adherence since the treatment initiation, as per the Ni-kshay portal. Human-in-loop is incorporated if the tool fails to analyse symbols due to errors.

Results/Impact: The AI tool successfully detected the adherence table on the card and extracted the data from the cells.

Evaluated on 140 cards, the model achieved an overall accuracy of 97% in correctly identifying the cells and classifying symbols. The symbol classifier in the AI tool had an accuracy of 97%, while the table detector has a mean Average Precision (mAP) of 0.99.

Sensitivity was high for supervised doses (96%), missed doses (95%), and blank cells (98%), and moderate for unsupervised doses (76%).



Conclusions: The AI tool can facilitate accurate and rapid digitization of treatment card adherence data. Its implementation is expected to substantially improve the completeness and timeliness of treatment adherence reporting within the national Ni-kshay portal.

EP12-818-19 Outcomes of TB screening of immigrants using AI-enabled digital X-rays at the Lagos-Abidjan corridor

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Background and challenges to implementation: The Lagos-Abidjan corridor is a high-mobility route in West Africa with an increased risk of tuberculosis (TB) transmission among migrants due to poor access to screening and treatment services. The challenge of early TB detection in this mobile population prompted the deployment of the mobile X-ray van equipped with digital AI-enabled X-ray systems to improve screening efficiency.
Intervention or response: A TB screening campaign targeting immigrants was conducted at the Lagos-Seme border during the flag-off of the cross-border TB active case finding activity. A parallel screening algorithm combining the WHO four-symptom screen (W4SS) and artificial intelligence (AI)-enabled digital chest X-rays was adopted. Individuals with symptoms or CAD4TB scores ≥40 were classified as presumptive and submitted sputum for bacteriological testing using GeneXpert. Radiologists reviewed chest X-ray images via the XMAP platform, and case confirmation was conducted by medical officers.
Results/Impact: A total of 278 immigrants were screened. Of these, 36 individuals were identified as TB presumptives (29 through W4SS and 7 through CAD4TB score ≥40). Four TB cases were diagnosed, yielding an 11% case detection rate—one bacteriologically confirmed and three clinically diagnosed.
The intervention provided integrated care by offering both TB and HIV screening, reducing missed opportunities for diagnosis. The deployment of AI tools improved presumptive identification, especially among asymptomatic individuals.

Conclusions: The use of AI-enabled digital X-rays during the flag-off TB screening campaign at the Lagos-Abidjan corridor is relevant for reaching mobile, high-risk populations. Integrating digital tools with W4SS enhances TB case finding, reduces the incidence of missing TB cases and promotes cross-border collaboration. This model is scalable for broader regional implementation across similar mobile communities.

EP13 Electrifying TB: Using digital tools across the care cascade

EP13-819-19 Implementation of the TB electronic monitoring system in Uganda

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Background and challenges to implementation: For years, Uganda's National TB and Leprosy Program (NTLP) relied on paper-based data collection and DHIS2 aggregate reporting, prone to errors and limited access to real-time patient-level information. Recognizing the need for a robust TB surveillance system, the Ministry of Health (MOH), in collaboration with partners, developed eCBSS to improve data accuracy, facilitate patient monitoring, and enhance program performance. The system enables real-time data capture at health facilities, ensuring that all TB and leprosy cases are tracked throughout the continuum of care.
Intervention or response: The NTLP, supported by stakeholders, piloted eCBSS in 99 health facilities between January and June 2021. Based on its success, a nationwide rollout followed, expanding to 1,511 facilities by December 2024, covering 72% of TB Diagnostic Units. Key interventions included capacity building through extensive training sessions equipped health workers with skills in system use, Regional Support Structures through district leadership, mentorship, peer-to-peer learning, and virtual webinars strengthened system adoption. DHIS2 was still in use to gauge the amount of data being captured electronically.

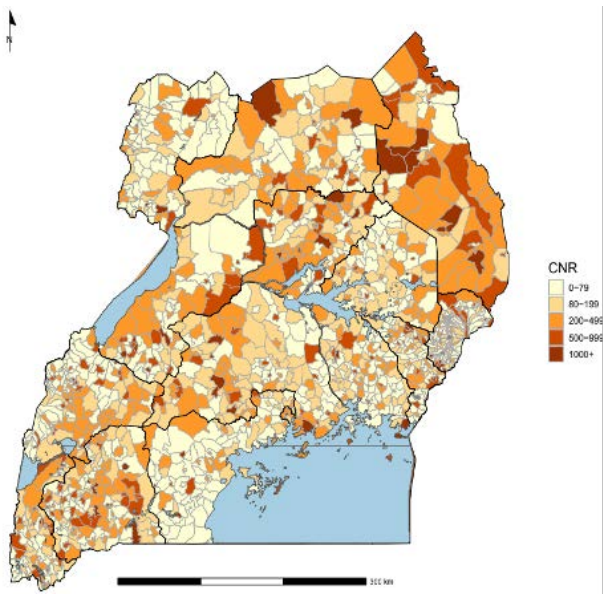

Figure. eCBSS Hot spots at subcounty level FY2023/2024.

Results/Impact: 80% of persons with TB reported in DHIS2 are now captured in eCBSS, enhancing data accuracy. The eCBSS has facilitated the mapping of TB hotspots guiding targeted interventions; the system improved data timeliness, completeness, and precision, leading to better patient outcomes.
Conclusions: Implementing eCBSS has strengthened TB surveillance in Uganda by providing patient-level data. Continued expansion, integration, and stakeholder engagement will ensure sustainability and improve TB prevention and care efforts. The system serves as a model for digital health transformation in disease surveillance.

EP13-820-19 Enhancing TB prevention and care in Maharashtra: Insights from Expand ELEVATE project through automated data analysis

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Background and challenges to implementation: The TB *Mukt Panchayat* (TBMP) initiative under National Tuberculosis Elimination Programme (NTEP) empowers *Panchayat*, India's rural self-governance system at village council level, to combat TB through improved ownership. *Panchayats* are screened annually using six NTEP criteria to be declared TB-free for a year.
The Expand ELEVATE (Engaging Local Experts for Validating and Analyzing TB data to End-TB in India, E2), a data management project to support TB elimination activities, supported TB elimination efforts in Maharashtra by automating TB-free status eligibility analysis.
Intervention or response: In Maharashtra, with 27,888 *Panchayats* across 34 districts, manual data compilation and analysis for progress review routinely required days and wasn't accurate.
In September 2024, E2 developed an automated digital dashboard to streamline monthly collation and analysis, generating state-level dashboards with district-level dropdown lists (Figure-1).
From September 2024 to February 2025, E2 provided monthly technical assistance to review progress and take programmatic actions. Additionally, E2 trained two state NTEP staff to replicate and utilize the tool for future needs.

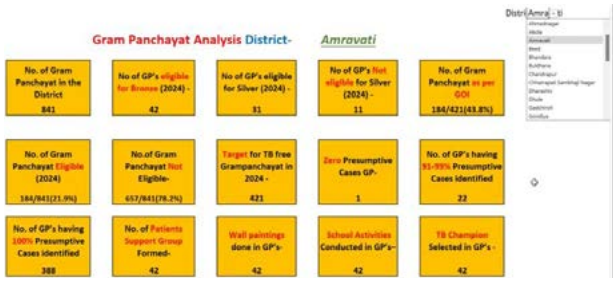

Figure 1. Snapshot of TB Free Panchayat dashboard for Maharashtra state, India.

Results/Impact: The automated digital tool improved efficiency by reducing data collation and analysis time from three to one day, eliminated errors, and enabled quick decision making. Timely planning and execution led to a cascade of prompt actions in districts. In Maharashtra, 7,402 (27%) *Panchayats* were declared TB-free in 2025, compared to 2,251 (8%) in 2024.

Additionally, staff acquired skills in designing similar tools and using them in other aspects of the program for prompt decision-making, leading to more effective health interventions.

Conclusions: The TBMP initiative, supported by the E2 project, demonstrated the effectiveness of data automation and capacity-building in improving TB data management using data at a local level result in making real gains in ending TB on the ground. By emphasizing timely data for decision-making and empowering local staff with smart data tools, the project further strengthened TB elimination efforts.

EP13-821-19 Improving DHIS2 TB data quality across regions in Uganda

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Background and challenges to implementation: The National TB and Leprosy Program (NTLP) relies on an electronic-based health management information system (eHMIS) based on District Health Information Software 2 (DHIS2) for TB reporting and programmatic decision-making. However, data quality issues such as incomplete reports, inconsistencies between paper-based and electronic records, and duplicate entries have hindered accurate reporting. To address these challenges, the NTLP and stakeholders initiated a multi-pronged approach to enhance data integrity across MOH regions.

Intervention or response: A structured data quality improvement strategy was adopted in 2023 focusing on Pre-Data Collection Meetings involving training and sensitization sessions before routine data collection cycles to ensure correct data capture and reporting, Desk Reviews through routine analysis of DHIS2 data to identify anomalies, missing reports, and inconsistencies and shared out on a weekly, monthly and quarterly basis. Data Validation Meetings where regional-level engagements involving district biostatisticians and TB focal persons to reconcile discrepancies. Data Cleaning through systematic removal of duplicate cases and correction of misclassified data entries. Remote Support which involve virtual mentorship, troubleshooting, and refresher training for health workers to enhance DHIS2 proficiency.

Results/Impact: These interventions led to significant improvements in TB data quality. Completeness of reports increased from 88% in 2020 to 98% in 2024, and discrepancies between DHIS2 and facility-level data reduced by 33%. The engagement of biostatisticians and focal persons fostered greater ownership and accountability in TB data reporting.

Conclusions: A combination of desk reviews, validation meetings, data cleaning, remote support, and structured pre-data collection meetings has proven effective in improving TB data quality in DHIS2. These interventions should be sustained and scaled up to ensure continuous data integrity and facilitate evidence-based TB programming.

EP13-822-19 Digitising TB care: Advancing person-centred approaches through T-bu Lite in Nakuru County, Kenya

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Background and challenges to implementation: Kenya bears a high TB burden. To strengthen TB data capture and verification, the National Leprosy and TB Program (NLTP), in collaboration with Amref and supported by the Global Fund, developed TIBU—an application used by Sub County TB and Leprosy Coordinators (SCTLCs) nationwide. However, with over 4,000 TB treatment sites, monthly mentorship and data verification remain unfeasible.

Moreover, TIBU is not a point-of-care system, resulting in continued reliance on paper tools and increased workload for healthcare workers, impacting patient-centred TB care.

Intervention or response: To address these gaps, T-bu Lite—an application integrated with TIBU—was piloted by Amref and the Nakuru County Department of Health, with support from the Italian Agency for International Cooperation, starting December 2023. Imple-

mented in 20 facilities, the system enables real-time data access for timely, patient-centred-decisions. Facilities were equipped with computers and internet routers, and healthcare workers were trained on TIBU for data entry and use. Key features include real-time data capture, reduced documentation burden, and SMS appointment reminders to enhance patient adherence.

Results/Impact: The proportion of TB patients notified-within-one month rose from 69% in 2022 to 93% in 2024. In pilot sites, 70% of sputum follow-ups were updated in 2024, compared to 54% in non-pilot sites. Treatment outcome updates within-one-month in Nakuru County increased from 70% in 2022 to 96% in 2024. SCTLCs now dedicate more time to mentorship, while healthcare workers focus on quality care. The system has improved data accuracy and timeliness, enhancing facility-level decision-making.

Conclusions: The digitization of TB data through the TIBU system has demonstrated promising results in improving patient-centred care in Nakuru. Reducing the reliance on paper-based tools and enabling real-time data access, has enhanced case notification, treatment outcomes updates, and overall efficiency in TB management. This approach serves as a model for regions aiming to improve TB care through digital health solutions.

EP13-823-19 Integrated genomic and epidemiological surveillance of TB in Germany, 2020-2024: Results from three cities

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Background: Tuberculosis (TB), particularly the emergence of drug resistant *Mycobacterium tuberculosis* complex (MTBC) strains, remains a major public health challenge. Whole genome sequencing (WGS) of MTBC isolates combined with classical epidemiology enhances comprehensive TB surveillance, including monitoring of resistance levels and impact of migration on transmission. Local public health authorities (LHAs) in Hannover, Hamburg, and Frankfurt/Main, the Robert Koch Institute and the National Reference Center for Mycobacteria delivered a comprehensive set of integrated molecular and epidemiological data.

Design/Methods: Key epidemiological parameters of the patients notified within the TB notification system were linked with WGS results, including information on molecular clusters. We present descriptive analysis of the data from 2020-2024.

Results: 1,293 culture-positive TB cases were notified from the study sites; WGS data was linked to 909 (70%) of them. 332/909 (37%) of these cases were part of 175 molecular clusters, which also involved cases notified by other LHAs, and without linked epidemiological data (Table 1).

Among 175 clusters, 157 (90%) included cases born outside of Germany (n=354), five of them with children below the age of 15 (n=7). Further six clusters involved children born in Germany (n=8). Of the cases born abroad with available information (n=325), 35% developed TB within two years, 38% within 3-9 years, and 26% within ten or more years upon arrival in Germany. Drug-resistant TB was identified in 46 clusters (26%), involving 156 cases, including two clusters with pre-XDR-TB (n=9) and one cluster with XDR-TB (n=1).

Table 1 Number of cases in the detected molecular clusters by year and region; n (%).

District/Year	2020	2021	2022	2023	2024	NA[1]	Total
Region Hannover	3 (5.3%)	19 (28.4%)	9 (11.5%)	13 (9.5%)	5 (4.1%)	0 (0.0%)	49(6.3%)
Frankfurt am Main	16 (28.1%)	15 (22.4%)	14 (17.9%)	17 (12.4%)	14 (11.4%)	0 (0.0%)	76 (9.8%)
Hamburg	38 (66.7%)	32 (47.8%)	36 (46.2%)	53 (38.7%)	22 (46.8%)	0 (0.0%)	207 (26.8%)
Other districts	0 (0.0%)	1 (1.5%)	19 (24.4%)	54 (39.4%)	56 (45.5%)	0 (0.0%)	130 (16.9%)
Unlinked cluster cases[1]	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	309 (100.0%)	309 (40.1%)
Total	57 (100.0%)	67 (100.0%)	78 (100.0%)	137 (100.0%)	123 (100.0%)	309 (100.0%)	771 (100.0%)

[1]For all cases with missing link between epidemiological and molecular information, assignment to district and notification year was not possible. Those cases are presented as "unlinked cluster cases".

Conclusions: The identification of clusters spanning multiple regions and occurring long after migration highlights the critical role of WGS in nationwide TB surveillance. Integrating epidemiological and molecular data enhances the detection of transmission and events specific to risk groups or settings, making it a crucial tool for modern TB surveillance. These insights support the development of targeted interventions, ultimately strengthening transregional TB control efforts.

EP13-824-19 Advancing TB monitoring: Digitalisation of Nepal's National Tuberculosis Programme

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Background and challenges to implementation: Nepal's National Tuberculosis Program (NTP) has made significant progress in digitalizing its data management system to improve TB surveillance and program performance. The initiative aims to ensure real-time, case-based data capture and reporting across service delivery points.
Intervention or response: The NTP developed the National Tuberculosis Program Management Information System (NTPMIS), leveraging local expertise and integrating it within the DHIS2 Tracker platform. As of 2024, this system is functional in 6,241 DOTS centers (eTB Register), 117 GeneXpert labs, 29 Drug-Resistant TB (DRTB) treatment centers, and 2 culture and DST labs.
A separate PPM system captures case data from pharmacy referral interventions and is linked to the eTB register. Biometric systems have been introduced at GeneXpert and DRTB sites to reduce duplicate entries and improve patient tracking.
Aggregated reporting tools were also developed to monitor partner contributions and TB Free Initiative. Centralized data security is ensured through three-tier server backups at National Information Data Center (Kathmandu), Disaster Recovery Office-DRO (Hetauda), and National Tuberculosis Control Center (NTCC).
Results/Impact: Over 300,000 clint records are managed annually through NTPMIS, significantly improving data quality and traceability. While full integration with the national Health Management Information System (HMIS) has been for GeneXpert and DRTB data, 80% integration has been reached for drug-sensitive TB (DSTB), with full alignment expected by 2025. However, only 5% of Designated Microscopic Centers (DMCs) currently use digital tools due to infrastructure gaps.
Conclusions: Nepal's digital transformation in TB surveillance marks a pivotal achievement in public health, enabling real-time reporting, enhancing data use, and improving service delivery.
Continued investment in robust infrastructure, seamless interoperability, and cloud migration is expected to further amplify the program's effectiveness and sustainability, while acknowledging that although a formal data protection policy is not yet established, significant efforts are in place to safeguard patient information and ensure privacy.

EP13-825-19 Improvement of TIBULIMS connectivity solution in Kenya with integration with DELFT's CAD4TB machines in Kenya

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Background and challenges to implementation: Kenya's National Tuberculosis Program (NTP) has utilized GxLIMS for GeneXpert data management since 2014. However, the introduction of new WHO-recommended diagnostics (WRDs) in 2022 necessitated an upgraded TIBULIMS platform to integrate GeneXpert/Ultra, TrueNat, and CAD4TB. The Delft Light ultra-portable X-ray machines with CAD were integrated into TIBULIMS, but limitations of the existing Thirona (CAD4TB) system—restricted module variables, lack of national-level data access, minimal customization, and absence of remote CXR reading—hindered TB screening and monitoring. This led to the TIBULIMS-CAD4TB integration.
Intervention or response: The Kenya National TB Program developed TIBULIMS using Agile methodology to create an integrated diagnostic platform. This unified solution connected all WHO-recommended diagnostics (GeneXpert, TrueNat, and CAD4TB-enabled X-rays) into a single system. The development process emphasized stakeholder engagement and rigorous validation to ensure the platform met operational needs while maintaining flexibility for future adaptations.
Results/Impact: TIBULIMS has transformed TB diagnostics in Kenya, delivering real-time screening results within minutes of image capture and enabling remote radiologist interpretations within ≤1 hour for same-day clinical decisions. The system seamlessly correlates AI-generated CXR results with laboratory and clinical data, enhancing diagnostic accuracy. Operational improvements include 24/7 equipment monitoring and one-click reporting, reducing administrative workload by 60%. Unified dashboards now provide national-level visibility, geographic mapping of screening coverage, and facility-specific metrics, empowering program managers with actionable insights.
Conclusions: TIBULIMS-CAD4TB Integration has significantly improved data quality and accessibility, consolidating screening data from all sites into interactive dashboards. This integration showcases how digital health technologies can address implementation challenges in resource-limited settings, optimizing diagnostic efficiency, clinical workflows, and program monitoring. Its success serves as a model for other national TB programs aiming for integrated diagnostic data systems.

EP13-826-19 Enhancing timely monitoring and follow-up of drug-resistant TB: Implementing a digital laboratory information system in Uganda

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Background: In Uganda, more than 100,000 people were diagnosed in 2024 with Tuberculosis (TB), of which approximately 85% were started on TB treatment. Barriers such as transcription errors, incomplete data, and lack of sample tracking hinder TB diagnosis, routine monitoring of patients and treatment follow-up in Uganda. Using courier systems, emailing and localized laboratory information systems delays results dispatch, making it hard to initiate patients on the right medication due to lack of timely diagnostic results.

We upgraded the Tuberculosis Laboratory Information System (TB-LIS) at the National TB Reference Laboratory (NTRL) to address these gaps and align with WHO's digital health targets for TB elimination.

Design/Methods: Using the RE-AIM framework, we conducted implementation research to deploy an agile, custom-built TB-LIS connecting NTRL to two referral hospitals (January–April 2024). Data from 346 sample requests, questionnaires, and key informant interviews were analyzed to assess pre/post-implementation impact. Convenience sampling ensured representation across roles (clinicians, lab staff) and genders.

Results: The system was successfully installed at two referral hospitals. Sample tracking using the system was at 100% (346/346), reducing TB sample rejection rates by 1.3 times (pre-implementation was at 1.1% (8/681), while post was at 0.87% (3/346). Data completeness improved from 89% to 100% for demographics and laboratory indicators.

Timely access to results was at 100% (346/346) on the same day compared to 96% (654/681) ≥5 days before installation. Key barriers included unstable power, expensive internet and increased workload, while the availability of computers and computer literacy were key facilitators.

Conclusions: The TB-LIS enhanced connectivity between NTRL and MDR-TB sites, enabling real-time result access and patient profiling. Scaling this system nationally could reduce diagnostic inequities and support the WHO's End TB Strategy and address connectivity gaps.

EP13-827-19 Multi-country consortium data systems - setup, challenges, and solutions: A case study of the Start4All initiative

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Background and challenges to implementation: The Start4All initiative aims to enhance tuberculosis (TB) case detection, implemented across seven countries through a multi-centre cross-sectional study, involving presumptive TB cases identified in healthcare facilities and active case-finding (ACF) efforts. It targeted diverse populations, such as internally displaced persons (IDPs), refugees, and nomads. Implementing a standardised data collection and management system across multiple countries presented challenges, including country-specific database preferences, data harmonisation, real-time quality assurance, and varying work weeks and time zones that disrupted real-time monitoring, coordination, and data submission.

Table 1: Study Sites and Target Populations

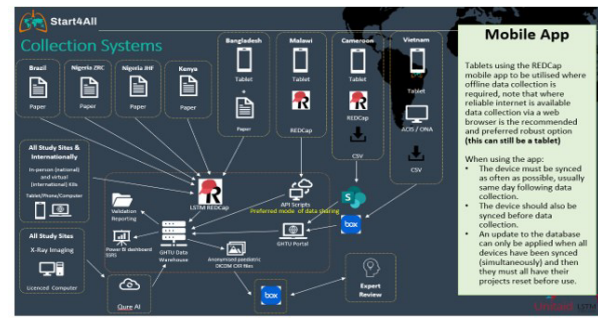
	Country	No Study sites	Region	Category	Key Population	Rec Target
1	Bangladesh	7	South Asia	ACF/SHF	Slum, Rural, Semi-Urban	3000
2	Brazil	3	South America	SHF	Rural, Semi-Urban	639
3	Cameroon	5	West Africa	ACF/SHF*	Rural, Semi-Urban	3300
4	Kenya	2	East Africa	SHF	Rural, Semi-Urban	1400
5	Malawi	3	East Africa	SHF	Rural, Semi-Urban	1200
6	Nigeria-ZRC ~ North-Central	3	West Africa	SHF	Rural, Semi-Urban	1700
7	Nigeria-JHF ~ North-East	6	West Africa	ACF	IDPs, Refugees, Nomads	2000
8	Vietnam	4	Southeast Asia	ACF/SHF*	Rural, Semi-Urban	3000
		33				**16239**

*recruiting children

Table 2: Data Collection & Transmission Plan

	Country	Data Collection & Collation Plan	Transmission Channel	Cadence
1	Bangladesh	Paper forms → LSTM REDCap Tablet → LSTM REDCap		Real-time
2	Brazil	Paper forms → LSTM REDCap		Real-time
3	Cameroon	Tablet → Local REDCap → LSTM	via SharePoint	Bi-weekly
4	Kenya	Paper forms → LSTM REDCap		Real-time
5	Malawi	Tablet → Local REDCap → LSTM	via API	Real-time
6	Nigeria-ZRC	Paper forms → LSTM REDCap		Real-time
7	Nigeria-JHF	Paper forms → LSTM REDCap		Real-time
8	Vietnam	Paper forms → ACIS / ONA → LSTM	via BOX	Bi-weekly
Cameroon + Vietnam		Peads DICOM images	via BOX	

Figure 1: Data Systems Schema



Intervention or response: A structured data collection framework was established using electronic data capture (EDC) systems such as REDCap and ACIS/ONA, and data manipulation and visualisation tools including MS-SQL, Visual Studio (VS), SQL Server Reporting Services (SSRS), and PowerBI. A hybrid paper-based and electronic transmission approach accommodated country-specific preferences.

Key interventions:
- Addressed data ownership concerns by providing real-time access to collected data and established API-based data sharing for interoperability.
- Standardising data-sharing protocols, CSV file exchange, and cadence agreements.
- Developed structured data systems assessment checklist to evaluate DM infrastructure and ensure compliance with (GCP) standards.
- Implemented secure, real-time sharing of X-ray DICOM files
- Addressed culture result entry challenges by integrating remote access for laboratory personnel and streamlining data entry at centralised locations.
- Established staggered data collection and transmission schedules to accommodate different work weeks and ensure timely reporting across time zones.
- For quality control (QC), SSRS was configured to send an automatic data query report to all sites at the same time weekly.

Results/Impact:
- 75% of sites achieving real-time data sharing.
- 100% QC & 70% query resolution rate within seven days.
- Secure X-ray image sharing improving diagnostic workflow.
- Reduced culture data turnaround time (TAT) through centralised entry.

Conclusions: This initiative provides a scalable model for cross-country TB programs, highlighting the need for adaptive data management frameworks to enhance real-time data integrity and operational efficiency.

EP13-828-19 Optimising electronic medical records to strengthen TB/HIV service delivery: A multi-phase redesign and evaluation of impact in Southern Nigeria

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Background and challenges to implementation: The ECEWS ACE-5 project uses the LAMIS electronic medical records (EMR) system to report key TB/HIV indicators. However, evolving program priorities and increased patient volumes revealed documentation challenges. Ambiguities in the TB module and overlapping data fields led to duplicate entries, confusion across screening, treatment, and prevention components, ultimately reducing data quality and weakening program monitoring.

Intervention or response: In May 2024, the project partnered with DATA.FI Nigeria to review and redesign the TB/HIV module in phases for improved functionality and reporting efficiency.

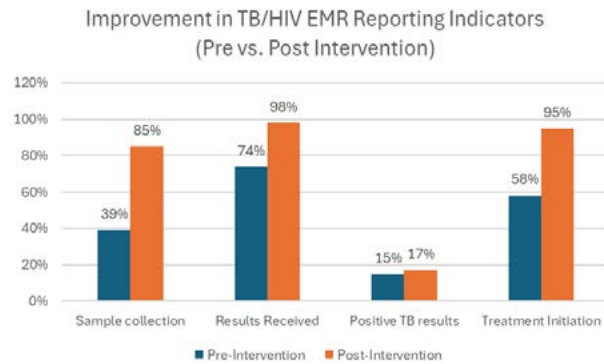
Phase 1: A participatory approach was adopted, engaging the LAMIS Community of Practice and ACE (Accelerating Control of Epidemics) project leads.

Phase 2: The system was redesigned to clearly separate TB screening, treatment, and prevention sections. Auto-population features were introduced to reduce data entry time and duplication and streamline data flow within the EMR.

Phase 3: Following approval, the upgraded module was deployed across all ACE-supported sites, accompanied by comprehensive staff training.

A comparative analysis of data from 225 facilities in Akwa Ibom and Cross River States was conducted, comparing five months pre-intervention period (April–August 2024) to five months post-intervention period (October 2024–February 2025) on the EMR, assessing key TB/HIV indicators.

Results/Impact: The post-intervention analysis showed significant improvements in TB/HIV data reporting across 225 facilities. Sample collection increased from 39% (1,344/3,477) to 85% (2,363/3,021), a 46% improvement. TB test results improved from 74% (989/1,344) to 98% (2,511/2,563), a 24% increase. The proportion of clients with documented positive TB results rose from 15% (149/989) to 17% (424/2,511). TB treatment initiation improved from 58% (86/149) to 95% (402/424), indicating enhanced reporting quality.



Conclusions: This intervention demonstrates the value of collaborative EMR optimization in strengthening TB/HIV service delivery. A well-designed and user-friendly EMR system is essential for improving data quality, facilitating real-time monitoring, and achieving better health outcomes in resource-limited settings.

EP14 Enhancing TB diagnosis and case finding among children

EP14-829-19 Enhancing childhoodTB detection in Bangladesh: The role of government hospitals and strategic screening initiatives

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Background and challenges to implementation: Childhood Tuberculosis(TB) remains underdiagnosed globally due to nonspecific symptoms and diagnostic challenges, particularly in children under five. In Bangladesh, children aged 0–14 accounted for only 3.39% of total TB notifications in 2021. To address this gap, the national TB program introduced strategic measures—including facility-based Active Case Finding (ACF) and stool testing—to improve pediatric-TB detection.
Intervention or response: Government strengthened systematic screening in public health facilities, particularly in outpatient departments, pediatric wards, and nutrition units. Stool testing was rolled out as a non-invasive diagnostic tool for young children. A notable proportion of TB in children under five was identified after the referral from government hospital, underlining their central role in early detection and emphasizing the crucial role of government hospitals in initiating referrals and facilitating accurate diagnosis,
Results/Impact: From Q1-2023 to Q4-2024, childhood-TB cases in children aged 5–14 years showed a steady increase from 1718 in Q1-2023 to 2817 in Q4-2024 (64% growth). Cases in children aged 0–4 years grew by 45%. Referrals from government hospitals shows significant rise for both age, with a 35% increase for 5–14 years and 36% for 0–4 years. Over 50% of total under-five children were diagnosed with TB after being referred from government hospitals in 2023 and 2024 which was below 45% during year 2022. The national proportion of childhood-TB increased from 3.39% in 2021 to 5.29% in 2024, marking significant gains in pediatric-TB detection.
Conclusions: The expansion of facility-based screening and adoption of stool testing significantly boosted childhood-TB case detection in Government hospitals of Bangladesh emerging as key diagnostic hubs, particularly for the child-TB. Efforts should focus on ensuring equitable access to diagnostic services, enhancing community awareness, and investing in continuous capacity building for healthcare professionals to improve TB diagnostics. These steps will help sustain and scale the gains in childhood-TB detection.

EP14-830-19 Leveraging community-based models and private sector engagement to improve paediatric TB detection in Sokoto State, Nigeria

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Background: Childhood tuberculosis (TB) remains underdiagnosed in rural Nigeria due to limited diagnostic infrastructure and delayed care-seeking. In Sokoto State, access to chest X-rays—vital for pediatric TB diagnosis—is lacking at most primary health facilities, resulting in underreporting and delayed treatment. To address this, a community-based intervention was implemented in 2023 to improve pediatric TB case detection. The initiative was supported by the Global Fund to Fight AIDS, Tuberculosis and Malaria, with the Leprosy Mission Nigeria as the Sub-Recipient and the Institute of Human Virology Nigeria (IHVN) as the Principal Recipient, under the Public-Private Mix (PPM) grant. Diagnosed cases were linked to private health facilities for care and follow-up.
Design/Methods: A structured biweekly transport model was used to convey children with presumptive TB from rural health centers to urban diagnostic facilities equipped with X-ray technology. To improve participation, meals were provided to address nutritional barriers. Simultaneously, outreach campaigns—delivered through local health workers and traditional town criers—were conducted to raise TB awareness, improve early case identification, and encourage caregiver engagement.
Results: The intervention significantly improved childhood TB detection, with all confirmed cases linked to private facilities. Monthly diagnostic referrals rose from 50 to over 250 children. Pediatric TB notifications increased by 239%, from 936 in 2022 to 3,170 in 2023. The contribution of childhood TB to overall notifications grew from 7.5% to 16%. Over 15,000 households were reached through community engagement, resulting in a 60% rise in presumptive TB referrals. Caregivers cited transport and nutritional support as key enablers for accessing diagnostic services.
Conclusions: This Global Fund-supported intervention demonstrates that integrated community transport, nutritional support, and private sector engagement can substantially enhance pediatric TB detection in underserved settings, offering a scalable model for replication.

EP14-831-19 Advancing TB detection in children with stool test: KNCV Nigeria experience

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Background and challenges to implementation: The Simple One-Step (SOS) Stool-based Xpert method is increasingly used in Nigeria for diagnosing childhood tuberculosis (TB). This approach is beneficial because it can identify TB in children who have difficulty providing quality sputum samples. The collection procedure is non-invasive, and testing is done at the primary health facilities, owing to its low biosafety requirements and user friendliness. We reviewed the contribution of the stool-based Xpert test to TB detection in Children across 14 KNCV-supported states.
Intervention or response: The low childhood TB notification in Nigeria necessitated the roll-out of the stool-based Xpert method. KNCV Nigeria, in partnership with the National TB and Leprosy Control program of Nigeria, decentralized stool testing to the primary health facilities and private sector where individuals first seek help. The capacity of the health care workers and laboratory staff were built on sample collection, transportation, and the stool processing procedure. Four-and-a-half-year retrospective data (July 2020 -January 2025) on stool tests performed for children aged 0- 14 years was downloaded from DHIS2 and analyzed using SPSS.
Results/Impact: In the period under review, a cumulative number of 138,358 stool samples from children with presumed TB across 14 States were evaluated using the SOS method. A total of 6,450 children were detected to have TB and 6426(99.6%) were put on treatment. The TB yield recorded was 5%.

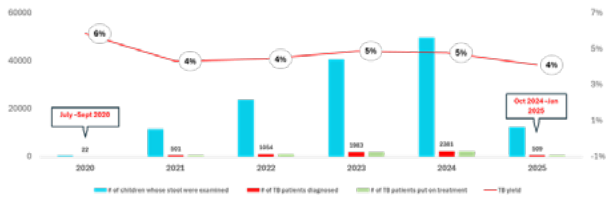

Fig 1: Stool test result from July 2020 – Jan 2025.

Conclusions: The SOS method has proven to be simple, robust and reliable, contributing to increased bacteriological confirmation and rifampicin resistance profile in TB cases in children.

EP14-832-19 Exploring role of CXR CAD for paediatric TB detection: A retrospective evaluation of CXR CAD performance in children and adolescents in Myanmar

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Background and challenges to implementation: Diagnosing TB in children is complex due to non-specific symptoms, limited bacteriological confirmation, and restricted access to radiology expertise. In Myanmar, chest X-ray (CXR) plays a vital role in pediatric TB diagnosis. To address diagnostic challenges and expand access to radiological screening, Computer-Aided Detection (CAD) software was introduced into TB services. However, evidence on CAD performance in pediatric populations remains limited, particularly for detecting classic features like hilar lymphadenopathy. Myanmar Medical Association implemented qXR version 3.2 in routine pediatric TB screening. This abstract presents a retrospective evaluation of its performance and early findings from a blinded exercise using version 4.2.
Intervention or response: From March 2023 to May 2024, 1,150 children aged 6–14 were referred for CXR from 99 GP clinics across 12 Yangon townships. CAD interpretation using qXR 3.2 was integrated into routine TB workflows. Each image was independently reviewed by three expert radiologists, blinded to CAD results, with consensus (≥2 of 3 agreement) used as the reference standard. Final TB diagnoses were made by trained clinicians. A subset of images was re-evaluated using qXR 4.2 under blinded comparison.

Metric	Measure (95% CI; n = 1150)		
Sensitivity	18.18% (15.95% - 20.41%)		
Specificity	98.38% (97.65% - 99.11%)		
Positive predictive value	51.43% (48.54% - 54.32%)		
Negative predictive value	92.74% (91.24% - 94.24%)		
AUC	0.58 (0.54 - 0.62)		
Statistic/ Metric	Children & young adolescents (n = 1150)	Children (n = 530)	Young adolescents (n = 620)
Agreement rate	23.91%	20.94%	26.45%
Cohen's kappa	0.01 (p=0.004)	0.006 (p=0.169)	0.02 (p=0.004)

Table 1: Results of qXR version 3.2

Results/Impact: qXR 3.2 flagged 3% of cases as presumptive TB versus 79% by radiologists, showing 18.2% sensitivity, 98.4% specificity, and AUC 0.58. As shown in Table1, agreement with radiologists was low overall (23.9%, $\kappa = 0.01$), and even lower among younger children (20.9%, $\kappa = 0.006$) than young adolescents (26.5%, $\kappa = 0.02$). Hilar lymphadenopathy was missed in 72% of discordant cases.

qXR 4.2 showed improved sensitivity (26.8%), specificity (94.6%), and agreement (κ = 0.04), though pediatric-specific features remained under-detected.
Conclusions: While CAD expands TB screening access, current tools remain limited in pediatric populations. Improvements in qXR 4.2 are promising, and findings support progressive CAD integration with clinical oversight. Continued refinement and validation in children are essential before broader use in TB programs.

EP14-833-19 Treatment decision algorithms to detect paediatric pulmonary TB in unstable settings: Experience in South Sudan

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Background and challenges to implementation: South Sudan's estimated incidence of tuberculosis (TB) is 227 per 100,000 people. In 2022 the WHO to recommend new treatment decision algorithms (TDAs) for pediatric pulmonary TB. Médecins Sans Frontières (MSF) supports 2 hospitals in Malakal, including pediatric wards and inpatient therapeutic feeding centers, as surrounding areas face instability, with frequent population movements. MSF implemented the TDA without x-ray in these two facilities in January 2024.
Challenges included high population mobility, high demand for human resources and training, and some clinician perceptions of over-treatment.
Intervention or response: To account for high population mobility and frequent early discharge against medical advice, laboratory tests (GeneXpert, TB-LAM) were ordered as soon as presumptive TB was identified at initial assessment for all children (instead of only for those at high risk of rapid TB progression), and follow-up visits started as soon as 5 days after initial assessment (instead of the 7-14 days recommended by the TDA). To support TB treatment continuation once initiated, health promotion teams increased calls and home visits.
To address high human resource demands, one TDA implementation focal-person was identified, supporting continuous refresher training.
Results/Impact: From January to December 2024, 264 children under 10 years were identified with presumptive TB, and 125 (47%) were started on TB treatment. Staff found the TDAs easy to use and helpful; however, in the absence of the focal person, the TDAs were less used and TB treatment initiation rates dropped.
Conclusions: We recommend adapting the model of care to the context, for success along the care continuum, including training and consensus-building while implementing the TDAs, and linkages to ensure treatment is completed once initiated. While having a focal person is valuable, decentralizing responsibility for algorithm use across clinicians from implementation start may support the sustainable use of the TDAs.

EP14-834-19 Traditional birth attendants are major contributors to finding childhood TB: Comparative analysis of childhood TB case-finding across TB LON 3 interventions in Oyo State

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Background and challenges to implementation: Tuberculosis remains a disease of public health concern in Nigeria as a leading cause of death across all age groups. Children are particularly more vulnerable and the mortality among this age group is disproportionately high. Early diagnosis and treatment are crucial for better outcomes, effective management, and control of TB among children. With the increased drive for optimal diagnosis of childhood TB, it is important to assess which interventions yielded CTB optimally.
Intervention or response: A comparative analysis of childhood TB yield from different interventions was conducted using IHVN TB LON 3 project data. The period of review for this study is January 2024 to December 2024. The interventions selected for this study are special population, community, public health facilities, private health facilities, traditional birth attendants (TBAs), stand-alone laboratories (SALs), proprietary patent medicine vendors (PPMVs). Selected metrics for the analysis are 'total number of children screened', 'total number of presumptive children evaluated', 'total number of cases diagnosed', 'total number of childhood TB cases diagnosed' 'Childhood TB yield', 'number needed to screen (NNS)', 'number needed to test (NNT)', 'total number of TB cases', 'proportion of CTB cases diagnosed among total diagnosed'.
Results/Impact: The analysis revealed that the intervention that is most efficient in childhood TB case detection is traditional birth attendants. From the table below, it is

observed that the TBA intervention has the highest CTB yield (15%). Furthermore, the TBA intervention is also shown to have the lowest NNS (80) and NNT (7) among all interventions. This infers that in terms of TB cascade efficiency, TBA intervention was unsurpassed for the period.

Interventions	Children (0-14) Screened	Presumptive Children (0-14)	Cases (0-14) diagnosed	CTB Yield	CTB NNS	CTB NNT	Total Cases (Adult TB +CTB)	Proportion of CTB cases
Community	21748	1653	122	7%	178	14	2266	5%
PPMVs	3989	559	43	8%	93	13	826	5%
Private Health Facilities	32047	1631	50	3%	641	33	1151	4%
Public Health facilities	308430	7487	349	5%	884	21	4834	7%
SALs	3796	73	3	4%	1265	24	77	4%
Special Population	170	24	2	8%	85	12	108	2%
TBAs	1685	144	21	15%	80	7	246	9%

Conclusions: TBAs have potential to be game changers in childhood TB case detection. Allocating more resources and scaling up TBA interventions in programs can significantly increase CTB case detection.

EP14-835-19 Overcoming barriers to childhood TB detection: Scaling up childhood TB case detection through integrated facility and community-based interventions in Niger State, Nigeria

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Background and challenges to implementation: Nigeria remains among the top contributors to the global childhood tuberculosis (TB) burden, with an estimated 59,000 children (0–14 years) developing TB annually (Global TB Report, 2024). Diagnosing TB in children, particularly those under five years, is challenging. The National Strategic Plan targets a 15% contribution of childhood TB to total notifications; however, Niger State recorded only 2.5% in 2022, the lowest nationally. This highlighted critical gaps in child TB detection requiring innovative and targeted approaches.
Intervention or response: A multisectoral strategy was implemented in 2023–2024 to improve childhood TB detection. Key activities included stakeholder engagement to identify barriers, capacity building for health facility staff and community TB workers, collaboration with the State Nutrition Programme to enhance screening coverage. Outreach screening was intensified in child clinics, schools, orphanages, internally displaced persons (IDP) camps, etc. Stool sample testing using Gene Xpert was scaled up, with laboratory scientists retrained and sample referral systems strengthened. Uptake of free chest X-rays were promoted through social mobilization, National Childhood TB Testing Week commemorated according to NTP guidance.
Results/Impact: Childhood TB notifications increased from 151 in 2022 to 256 in 2023 (70% increase) and 532 in 2024 (108% increase). The proportion of childhood TB among total TB cases rose from 2% in 2022 to 5% in 2024, despite a 4,000-case increase in overall TB notifications.
A total of 862 stool samples were tested in 2024 across five Gene Xpert sites, yielding 17 positive results (2% positivity rate). Stool testing contributed to 3% of total childhood TB diagnoses. Males accounted for 56% of childhood TB cases and females 44%.

Childhood TB Notification in Niger State			
	2022	2023	2024
Total persons with diagnosed	6440	8104	10405
Absolute Number of Children	151	256	532
proportion of children	2%	3%	5%

Sex disaggregation of Childhood TB (0-14yrs)			
	2022	2023	2024
Male	51%	60%	57%
Female	49%	40%	43%

Conclusions: Integrated facility and community-based interventions, including collaboration with the nutrition programme, scale-up of stool testing, and nationwide testing initiatives, significantly improved childhood TB detection in Niger State. This approach offers a scalable and context-appropriate model for similar high-burden, low-resource settings.

EP14-836-19 Innovative approach to finding missing child TB cases in Nigeria: An account of the national child TB testing week

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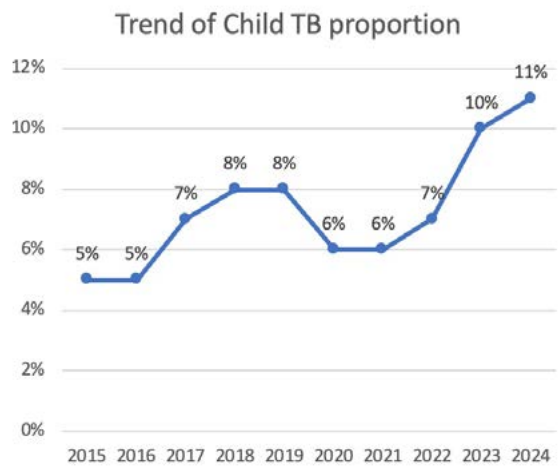
Background and challenges to implementation: Nigeria notified 285,561 tuberculosis (TB) cases in 2022 with children accounting for only 7% which is far from the 14% national strategic plan target. This study demonstrates the impact of the innovative national child TB testing week on childhood TB notification in Nigeria. This exercise was conducted in May 2023 across 36 states and the federal capital territory.
Intervention or response: A pre-mapping of all child health care or congregate settings was done in all 36+1 states including immunization clinics, post-natal-wards,

child-friendly-centres, orphanages, nursery and primary schools, and nutrition clinics. A team made up of state/LGA TB programme officers, partners and community health workers were mobilized to create awareness on the testing locations. Then a general consent was obtained from caregivers for symptomatic screening of children or screening with X-ray for TB.

Presumptive had their sputum/stool collected, packaged, and moved to GeneXpert centres for testing. Caregivers of children with confirmed TB were contacted and children started on TB treatment. The national TB programme (NTP) recording tools were used for documentation, from which data was aggregated

Results/Impact: At the end of one week, 1,231,436 children were seen, 636,369 (52%) screened for TB, 177,570 (28%) presumptive TB were identified, 159,783 (90%) were tested, and 7,806 (5%) TB cases were diagnosed and started on treatment. Number Needed to Screen was 82 and Number Needed to Test was 20.

This exercise resulted in an 11% childhood TB contribution in Q2 2023 and overall, childhood TB contribution increased from 7% in 2022 to 10% at the end of 2023. In 2024, similar event was held and has further improved child TB contribution from 10% in 2023 to 11% in 2024.



Conclusions: The child TB testing week is an innovative approach that has demonstrated the potential of increasing childhood TB notification in low resource settings.

EP14-837-19 Assessing CAD performance in detecting TB in paediatric chest radiographs

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Background: Tuberculosis (TB) detection in pediatric populations presents unique challenges due to differences in radiographic presentation compared to adults. This study evaluated the performance of computer-aided detection (CAD) software in detecting TB in chest radiographs (CXRs) of children under 15 years.

Design/Methods: Utilizing a case-control dataset of 1,476 pediatric CXRs divided equally into three age groups: under 5 years, 5–10 years, and 10–15 years, we evaluated three CAD software against an expert radiological reference standard (RRS). Software was only evaluated on CXR from children in the age group that the CAD software is recommended for use.

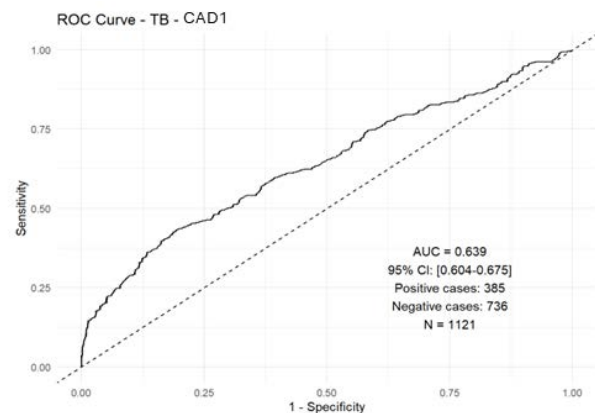
The area under the Receiver Operating Characteristic curve (AUC-ROC) was calculated for each software and CAD abnormality score distributions were generated for each of the three age categories, where relevant.

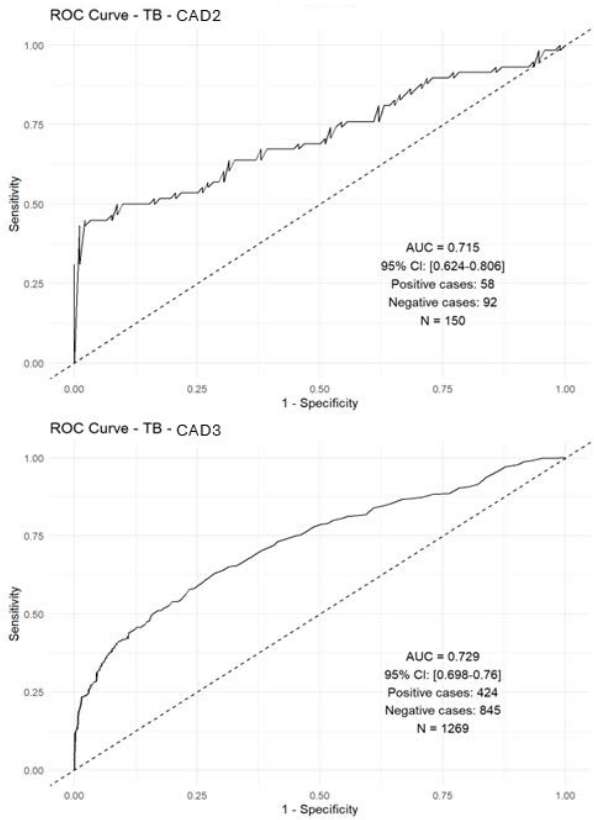
Results: CAD3 demonstrated the highest overall ability to detect TB with an AUC-ROC of 0.729 (95% CI: 0.698–0.760) in children aged 3 years and older.

CAD1 showed moderate performance with an AUC-ROC of 0.639 (95% CI: 0.604–0.675) in children aged 4 years and above.

This was surpassed by CAD2 (AUC-ROC: 0.715 [95% CI: 0.624–0.806]), but the latter software was only evaluated in individuals aged 14 years and older.

CAD3 generally allocated very low abnormality scores across age groups, while CAD1 tended to allocate higher abnormality scores to the youngest age group (<5 years old), despite this group having the lowest number of TB cases according to the RRS.





Conclusions: The accuracy of CAD for detecting pediatric TB varies widely across software, with CAD2 demonstrating promising accuracy. Further research is needed to evaluate CAD in pediatric populations for the development of evidence-based policy.

EP14-838-19 The current landscape of artificial intelligence-assisted chest radiography for paediatric TB: A scoping review

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Background: Tuberculosis (TB) remains a major cause of death among children, particularly in resource-limited settings. While computer-aided detection (CAD) systems are increasingly used for TB screening, pediatric-specific evidence remains scarce. This scoping review provides an overview of the current literature on CAD tools for pediatric chest radiography and highlights research gaps.
Design/Methods: Using Arksey and O'Malley's framework, we searched five databases (PubMed, Cochrane, Scopus, Embase, Web of Science) for studies published between 2000 and 2024. Eligible studies reported on CAD systems applied to pediatric chest X-rays (ages 0–18). Screening and data extraction were conducted using Covidence and Excel. Data included study design, age group, setting, CAD product, reference standard, and outcomes. Results followed PRISMA-ScR guidelines.
Results: Out of 9,190 records retrieved, 389 studies were relevant, and 158 included pediatric data. Only nine (2.3%) focused exclusively on children. Most studies assessed diagnostic performance or algorithm development, primarily using CAD4TB (Delft, NL).
The most commonly used datasets were Shenzhen, Montgomery, and NIH, with pediatric representation of 9.42%, 3.63%, and 3.2%, respectively. The highest reported accuracy was 98% from an ensemble machine learning model, while JF CXR-1 demonstrated the best overall performance (sensitivity 94.2%, specificity 91.2%, AUC 0.98).
Only one study used a Microbiological Reference Standard (MRS), while most others relied on radiological interpretation. Key challenges included limited pediatric datasets, inconsistent labeling, and underrepresentation of children in model training and validation.

Author (Year)	Tool/Study Focus	Pediatric Data	Gold Standard	External Validation	Performance
Mouton (2010)	Prototype System	High	N/A	Low	Not reported
Tezoo (2012)	Prototype Model	High	Low	Low	Not reported
Padash (2022)	Systematic Review	Moderate	N/A	N/A	N/A
Palmer (2023)	CAD4TB	Moderate	Low	Low	AUC 0.72; Sens ~72%, Spec ~66%
Yang (2023)	JF CXR-1	High	Moderate	Moderate	AUC 0.98; Sens 94.2%, Spec 91.2%
Amin (2023)	Qure.ai	Moderate	Low	Low	F1 0.88; Acc 98% (TB class)
Capellán-Martín (2023)	Custom DL Model	High	Low	Low	Not reported
Edem (2024)	CAD4TBv7	High	High	Low	Sens 50.3%, Spec 98%, AUC ~0.70
Capellán-Martín (2024)	Tool Comparison	High	Low	Low	Not reported

Evidence Gap Map of Pediatric TB-CAD Studies: Diagnostic Tools, Data Representation, and Reported Performance (2010–2024)

This table summarizes nine studies on pediatric TB-CAD, highlighting key areas such as pediatric data use, diagnostic reference standards, external validation, and reported performance. "High" means strong evidence, such as use of pediatric-specific data or microbiological confirmation. "Moderate" indicates partial or mixed data. "Low" reflects limited evidence or methodological issues. "N/A" means the study did not apply or report a standard. Reported metrics include AUC, sensitivity, specificity, accuracy, or F1-score. The color coding helps identify strengths and gaps in the current research to guide future work.

Conclusions: Current evidence on pediatric TB-CAD remains limited and methodologically inconsistent. There is a pressing need for age-appropriate, validated datasets and standardized diagnostic frameworks. Future research should prioritize clinical implementation, inclusive population representation, and harmonized reporting to improve the use of CAD in pediatric TB detection and care.

EP15 Prevent to end: Catalysing implementation of TB preventive treatment

EP15-839-19 India's experience of programmatic implementation of TPT for contacts of people with drug-resistant

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Background and challenges to implementation: India's National TB Elimination Programme (NTEP) introduced TB Preventive Treatment (TPT) for contacts of drug-resistant TB (DR-TB) patients in 2022. Provider hesitancy and low access to TB infection (TBI) test, Isoniazid (H)/ Fluoroquinolone (FQ) Drug Susceptible Testing (DST) were initial challenges in the roll out. The implementation experiences and outcomes of DR-TB patient contacts provided TPT under NTEP were documented to inform strategies for future scaling up.
Intervention or response: After ruling out TB, contacts were offered 6 months of daily levofloxacin (6Lfx) for FQ-susceptible MDR-TB exposure or 4 months of daily rifampicin (4R) for isoniazid mono/poly-resistant TB (Hr-TB) with Rifampicin-susceptible exposure. Provider hesitancy was tackled through advocacy and evidence-based communication. Screening used symptoms, chest X-ray, upfront NAAT, and TBI tests. Access to Line Probe Assay improved DST for Isoniazid and FQ. Resources for drugs, TBI tests, funds, and nutrition were ensured. Community engagement promoted adherence with $3 incentives for supporters. A TPT module in Ni-Kshay enabled real-time tracking of TPT care from enrolment to outcomes.
Results/Impact: Between Jan ,22 and Dec ,24, 3,534 MDR/RR-TB patient contacts were started on the 6Lfx regimen, achieving 89% treatment success among 1,770 initiated in 2023. Additionally, 2,432 Hr-TB patient contacts were placed on the 4R regimen from Jan ,23 to Dec ,24, with 79% success among 1,424 initiated in 2023. Scaling up TPT was supported by TB screening during active case finding, TBI and H/FQ testing, advocacy, digital tools, and community engagement. Long-term follow-up to monitor break-through TB and resistance amplification is ongoing.
Conclusions: India's experience demonstrates that with adequate resources, digital tools, advocacy and community engagement, TPT for DR-TB contacts can be effectively scaled. Continued efforts will be key to achieving higher TPT coverage and completion to enable accelerated incidence reduction on DR-TB among contacts.

EP15-840-19 Opportunities for optimising routine delivery of TB preventive treatment for people living with HIV in high-burden TB settings

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Background: Short-course TB preventive treatment (TPT) regimens including the weekly three-month Isoniazid and Rifapentine (3HP) are safer with higher completion rates in clinical trials. However, few descriptions from programmatic settings exist. We descriptively summarized TPT outcomes**.**
Design/Methods: From 2021-2023, we conducted a 24-month observational cohort study of people living with HIV (PLHIV) either initiating or refilling antiretroviral treatment (ART) in nine health facilities in Ethiopia, South Africa and Zimbabwe. Socio-demographic and clinical data were collected at enrolment. During follow-up, TB symptoms and TPT-side effects were reported to study staff. TPT initiation, completion, and TB diagnoses were abstracted from clinic records.
A subset of participants used an electronic dose monitoring (EDM) box to track completion. Sputum-based microbiological TB investigations were done on all participants at 12-and 24-months post-enrollment.
Results: We enrolled 2,095 participants, mostly female (n=1,489;71.1%), with a median age of 42 years (interquartile range:35-50). 1,828(87.3%) were established on ART and 1,312(62.6%) had no prior TPT history. We identified 1,075 TPT-naïve PLHIV who initiated TPT [3HP:613(57.0%) and 6H/12H:462(43.0%)] within one week of enrolment. Of these, 59/1,075(5.5%) reported TB symptoms. During follow-up, a total of 241 TPT-related side-effects were reported by 156(14.5%) PLHIV [3HP (n=190/613(31.0%)) and 6H/12H (n=51/462(11.0%))].
Treatment interruption was reported by 250(23.3%) PLHIV and most reported forgetting to take TPT (n=90;36.0%). TPT completion was documented for 955(88.8%) and semi-objectively assessed via EDM for 366/734(49.9%).
Fourteen TB diagnoses were made; incidence rate of 0.74(95%CI:0.44-1.25)/100 person-years. Of these, 10(71.4%) were microbiologically confirmed and were all asymptomatic whereas four (28.6%) were clinically diagnosed.

Conclusions: In programmatic settings, TPT was well tolerated, but common treatment interruptions highlighted the need for patient-centered strategies to minimize them. Additionally, objective measurement of TPT completion is needed to address overreporting. Most TB in this TPT-exposed population was asymptomatic, leading to missed diagnoses, suggesting alternative approaches to standard symptom screening towards improving timely diagnosis.

EP15-841-19 TPT refusal rates and barriers among people who are HIV-negative TB contacts aged 5 years and above

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Background: In 2019, the National Tuberculosis program (NTP) updated guidelines recommending TB Preventive Treatment (TPT) among contacts to TB cases ≥ 5 years. However, uptake in this group remained low. In 2024, with support from USAID TBLON project, NTP commenced TPT surge to increase uptake among contacts ≥5 years.

We reviewed data collected from contacts who declined TPT to determine refusal rates and to identify barriers to uptake in this population.

Design/Methods: The surge was conducted between November 2024 and January 2025 in 89 public health facilities across 8 provinces in Zambia. Documented contacts to TB patients diagnosed between June and October 2024 were followed up for TB screening. Those eligible were initiated on TPT, except where TPT was unavailable. Individuals who declined TPT were administered a standard TPT decline form. We report descriptive summary statistics in proportions and frequencies.

Results: Of the 20,103 contacts identified, 19,710 (98.1%) were eligible for TPT and 14,248 (72.3%) were initiated. TPT refusal rate was 2% (462/19,710). Among those who refused, 383(83%) had a documented decline form: 202 (53%) were female, 137 (36%) aged 25-49 years, and 190 (50%) attained secondary level education. A total of 344 (90%) had previously heard about TPT.

Reported reasons for refusal included concern about side effects 125(33%), fear of stigma 75(20%), currently taking other medication 61(16%), low perceived risk of developing TB 48(13%), and lack of understanding of the benefits of TPT 32(8%). Overall, 134(35%) individuals reported being discouraged from taking TPT by family members (89, 66%), friends (30, 22%), neighbors (4, 3%) and church members (4, 3%).

Background and challenges to implementation: In 2019, the Zambia National Tuberculosis and Leprosy Program (NTLP) updated guidelines recommending TB Preventive Treatment (TPT) among HIV-negative TB contacts ≥ 5 years. However, uptake in this group remained low. In 2024, with support from USAID TBLON project, NTLP launched TPT surge to increase uptake among contacts ≥5 years. We reviewed data collected from contacts who declined TPT to determine refusal rates and identify barriers to uptake in this population.

Intervention or response: TPT surge was conducted between November 2024 and January 2025 in 89 public health facilities across 8 provinces in Zambia. Documented contacts of TB patients diagnosed between June and October 2024 were followed up for TB screening. Those eligible were screened and initiated on TPT, except where unavailable. Individuals who declined TPT were administered a standard TPT decline form. TPT decline was defined as refusing to initiate TPT despite receiving TB prevention counselling. We analyzed refusal rates using descriptive summary statistics.

Results/Impact: Of the 20,103 contacts identified, 19,710(98.1%) were eligible for TPT and 14,248(72.3%) were initiated. TPT refusal was 2% (462/19,710) and among those who refused, 383(83%) had a documented decline form: 202(53%) were female, 137(36%) aged 25-49 years, and 190(50%) attained secondary-level education and 344(90%) had previously heard about TPT.

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Conclusions: TPT refusal among ≥ 5 contacts was generally low and driven by modifiable factors. Social influences played a role in reduced uptake. Strengthening health education and community engagement is essential to improve TPT acceptance among eligible contacts.

EP15-842-19 Scaling up TB preventive treatment: Expanding coverage to all age groups, including people without HIV

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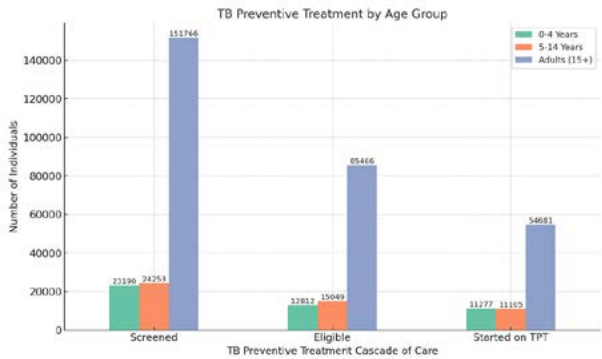
Background and challenges to implementation: Tuberculosis preventive treatment (TPT) traditionally prioritizes children under five and people with HIV, leaving older children (5-14 years) and adults significantly underserved. However, guidelines from the World Health Organization now recommend TPT coverage to all age groups, and expanding TPT to these groups is critical. This review analyzes multi-country implementation outcomes under the TB REACH initiative.
Intervention or response: Between Q1 2023 and Q2 2024, routine programmatic data from 18 TB REACH projects were aggregated and analyzed across 13 countries. Key cascade indicators—number screened verbally for TPT, eligible, and initiated on TPT—were systematically evaluated by three age groups (0-4, 5-14, and 15+ years). Nine projects included testing for TB infection, while others relied on ruling out active TB for eligibility based on in-country guidelines. Chi-square tests were performed to assess the expanded coverage across age groups statistically.



Results/Impact: A total of 199,209 individuals were screened, with notable expansions in older children and adults: 23,190 (11.6%) aged 0-4, 24,253 (12.2%) aged 5-14, and 151,766 (76.2%) adults aged 15+. Of these, 113,327 individuals were identified as eligible for TPT, including significant numbers from older age groups (5-14: 15,049; Adults: 85,466). A total of 77,063 (68%, Range: 11-15,343) initiated TPT, demonstrating effective enrolment strategies in older populations (5-14: 11,105; Adults: 54,681). Projects used TB infection tests in 24,732 individuals and confirmed 6,112 with TB infection. Chi-square analysis showed significant enrolment differences ($p<0.001$), highest in adults, followed by 5–14-year-olds, and lowest in under-fives. Five different TPT regimens were used across the 18 projects, including 3HP (n=17), 6H (n=15), 3HR (n=7), 4R (n=2), and 1HP (n=2).
Conclusions: Expanding TPT beyond traditional target age groups is feasible and achievable through strategic enrolment and tailored approaches. Continued advocacy, strengthened data collection, and ongoing monitoring will be essential to maintain and enhance these outcomes across diverse global settings.

EP15-844-19 Improving systematic TPT prescription using QuantiFERON®-TB Gold test results in Ukraine

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Background and challenges to implementation: Ensuring continuous and barrier-free access to tuberculosis infection (TBI) diagnostics and TB preventive treatment (TPT) is essential for reducing both TB transmission and incidence. Until 2021, the primary method for diagnosing TBI in Ukraine was the tuberculin skin test, which was used inconsistently, and access to QFT-Gold test was not widely established. Improved, patient-centered approaches for prescribing and supporting TPT were needed.
Intervention or response: From October 2021–September 2022, the USAID-funded, PATH-led Support TB Control Efforts in Ukraine (STBCEU) project engaged private laboratories to ensure continuous access to QFT-Gold testing for TBI diagnosis in 17 project regions. STBCEU conducted training and mentorship for regional TB specialists on improved TB case detection, rationalization for patient selection, short TPT regimens benefits, TPT referral algorithms, test result tracking, clinical management, clinical mentoring on interpreting QFT-Gold test results, patient management strategies, and TPT prescription protocol establishment, especially for TPT in QFT-negative persons older than five.
Results/Impact: From October 2021–December 2024, 11,613 individuals at high risk for TB were referred for QFT-Gold testing. Among the 9,836 tested, 1,976 (20.1%) had positive results. TPT was prescribed to 1,922 individuals, of whom 1,503 tested positive with the QFT test, while 419 tested negative.
The percentage of negative QFT patients over 5 years old receiving TPT declined from 18% to 0.4%, increasing to 4.3% due to testing initiation in 5 new regions and currently remains at 2.4%.

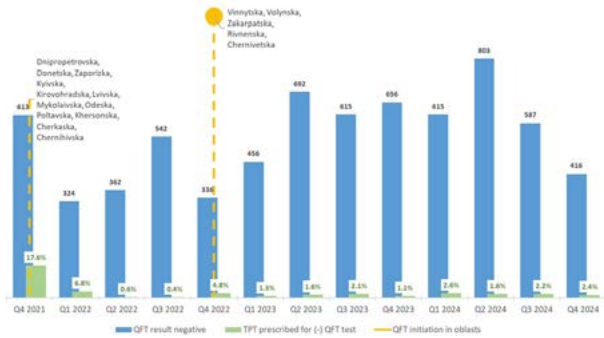

Figure 1: Percentage for TPT prescription for people above 5 years old with negative QFT test

Conclusions: The STBCEU-supported introduction of QFT-Gold testing significantly improved TBI diagnostics and TPT access for high-risk populations in Ukraine. Enhancing clinical decision-making and reduction of inappropriate TPT prescriptions has enabled a more effective, patient-centered approach to TB control. Continued expansion of testing and healthcare professional training is vital to sustain positive outcomes and further reduce TB rates.

EP15-846-19 Attrition among people with TB from contact screening until TB preventive therapy initiation: Programmatic challenges and bottlenecks in high-burden TB settings

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Background and challenges to implementation: Provision of TB preventive treatment (TPT) to infected and exposed individuals is a key strategy for halting the TB epidemic. Despite the aggressive programmatic roll out of TPT across the globe and availability of user friendly 3HP regimen, the uptake is still 21% among the estimated eligible households at global level, and 3.2% in Pakistan.
This study was conducted to determine the attrition of household contacts of bacteriologically positive (B pos) TB patients before TPT initiation at different stages of programmatic implementation.
Intervention or response: This cross-sectional study analysed the TPT programmatic implementation data of Public Private Mix models (PPM) in 28 districts of Pakistan, from November 2024 till February 2025. The TPT implementation included verbal screening of household (HH) contacts of bacteriologically confirmed TB patients followed by further screening through x ray to rule out TB disease. TPT was offered to all eligible and TB disease-free HH contacts through general physician clinic, large private hospitals, non-government organization (NGO) led hospitals and parastatal hospitals.
Results/Impact: During the study period, among 12 559 bacteriologically confirmed TB patients, 50 172 HH contacts (4 per index case) were identified. Among these, 27237 (54%) were verbally screened by field team, 957 (3.5%) were identified as TB presumptive, of these 396 (41%) were diagnosed with TB. Among the 26280 HH contacts who did not have TB symptoms, 5861 (22.3%) were further screened through x ray, among which 5683 (97%) started TPT. Pre-treatment attrition of 46% and 77.7% was observed at the step of verbal screening and x ray screening to rule out active TB disease.

Programmatic stages		GP model	Large private hospitals	NGO led hospitals	Parastatal hospitals	Total
B pos TB patients	n	8479	3640	178	262	12559
HH contacts	n	32846	15411	720	1195	50172
HH contacts verbally screened	n (%)	20488 (62%)	5937 (39%)	583 (81%)	229 (19%)	27237 (54%)
Presumptive TB among screened	n (%)	644 (03%)	289 (05%)	7 (01%)	17 (07%)	957 (3.5%)
TB patients diagnosed among presumptive	n (%)	248 (39%)	134 (46%)	5 (71%)	9 (53%)	396 (41%)
Eligible for TPT after verbal screening	n	19844	5648	576	212	26280
X ray screened to rule out disease	n (%)	2820 (14%)	2769 (49%)	160 (28%)	112 (53%)	5861 (22%)
HH contacts started TPT among screened	n (%)	2673 (95%)	2750 (99%)	156 (98%)	104 (93%)	5683 (97%)

Conclusions: TPT attrition is mainly observed at two steps; contacts screened by field team, and x ray screening to rule out disease. These programmatic challenges and barrier in access to TPT must be addressed through strategic interventions.

EP15-847-19 Identifying missed opportunities in tuberculosis preventive treatment care cascade: Analysis of programme data from Maharashtra, India

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Background: Tuberculosis infection is a condition when a person harbours the bacilli without having signs of active disease. In India, approximately 70% of household contacts of people with pulmonary tuberculosis have the infection. The national tuberculosis elimination programme recommends preventive treatment to household contacts of all people with pulmonary tuberculosis after ruling out active disease. Maharashtra is one of the bigger states in India with high tuberculosis burden.
Design/Methods: We analyzed the state programme data to describe the tuberculosis preventive treatment care cascade for household contacts of all notified people with pulmonary tuberculosis for the year 2023 in Maharashtra.
Results: Contact tracing was done for 84% of the 1,33,167 notified people with pulmonary tuberculosis. A total of 4,06,291 household contacts were enlisted out of whom 3,86,224 (95%) were screened for symptoms of tuberculosis. 185502 (45%) household contacts were listed as eligible for tuberculosis preventive treatment, of whom 101325 (55%) were initiated on tuberculosis preventive treatment. While 41,480 (41%) of those initiated on treatment successfully completed it, treatment outcomes were not recorded for around 57,191 (56%) of them. Tuberculosis preventive treatment completion as well as recording of treatment outcomes was lesser for 6H regimen, among contacts of those seeking care from private sector and clinically diagnosed people with tuberculosis.
Conclusions: Reasons for losses from the cascade need to be identified and addressed. Addressing missing data will further help in understanding programme performance. Frontline workers may be trained and utilized to capture real time data using simpler tools.
Aligning the annual India TB report with the guidelines by including household contacts of all notified persons with pulmonary tuberculosis instead of only microbiologically positive ones may improve treatment outcome recording among clinically diagnosed cases.
The capacity building, monitoring, and supportive supervision need further strengthening to improve the provision of tuberculosis preventive treatment care.

EP16 Finding the missing people with TB: Lessons learned from and across Nigeria

EP16-848-19 Unintended gains: How childhood TB awareness campaigns boosted adult TB case finding

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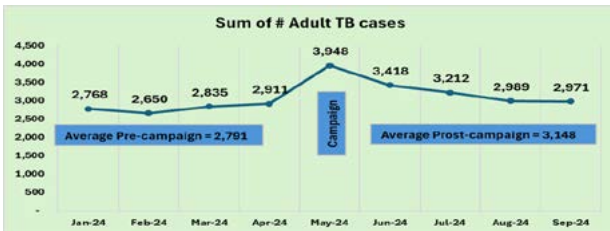
Background: Tuberculosis (TB) remains a significant public health challenge globally, particularly in high-burden countries like Nigeria. While targeted interventions often focus on specific population groups, there is growing evidence that awareness campaigns designed for one demographic can have broader, unintended benefits. In May 2024, a targeted Childhood TB Awareness Campaign was implemented, aiming to improve awareness, diagnosis, and treatment of TB in children under 15.
However, post-intervention data revealed an unexpected outcome—an increase in TB case detection among adults during the same period.
This study explores the secondary impact of a Childhood Tuberculosis (TB) Awareness Campaign on non-childhood TB case finding in Southwestern Nigeria in 2024.
Design/Methods: Using data from TB LON 3 project implemented by Institute of Human virology Nigeria (IHVN) with the support from USAID implemented in 4 Southwestern states of Lagos, Ogun Osun and Oyo State of Nigeria TB notification data were analyzed four months before and after the campaign.
Results: Findings showed a 41% increase in adult TB case notification on the month of campaign from an average of 2,791 to 3,948 cases and 13% from 2,791 to and average case of 3148 cases post-campaign. Many adult cases were identified after individuals attended health facilities with their children or engaged in community-based TB education activities.



The campaign's widespread messaging on TB symptoms and treatment reduced stigma and prompted more adults to seek testing. Community involvement and caregiver participation were key drivers of this ripple effect.
Conclusions: Although designed for children, the awareness campaign had a positive spillover effect on adult TB detection. This underscores the potential of child-focused interventions to benefit broader populations.
Future TB programs should integrate family-centered and community-wide messaging to maximize impact. Leveraging such unintended outcomes can strengthen TB case finding and support Nigeria's goal of reducing TB burden across all age groups.

EP16-849-19 Optimizing tuberculosis (TB) screening services using innovative strategies: Insights from TB LON 1&2 project implementation in Bauchi State, Nigeria

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Background and challenges to implementation: Tuberculosis remains a public health concern in Nigeria, particularly in rural underserved communities, where undiagnosed TB cases continue to pose a major challenge to TB prevention and care due to poor health seeking behaviour and limited access to healthcare services especially in remote and hard-to-reach populations. These undiagnosed TB cases continue to contribute to increased missing TB cases gap in Nigeria and globally.
We present results of innovative strategies from the TB LON 1&2 project in Bauchi state Nigeria targeted at optimizing TB screening services to find the missing TB cases.
Intervention or response: KNCV Nigeria, adopted innovative active TB case finding strategies aimed at bolstering TB control efforts under TB LON 1&2 project across the twenty LGAs in Bauchi state. These included Intensified Case Finding activities in public and private facilities using dedicated TB screening officers at service delivery points; Patent medicine vendors and Standalone laboratories engagement, Contact Investigation, Community TB screening in schools, facilities and hard to reach communities using EWORS, ACF in Special Populations and Active case finding using a mobile diagnostic unit, the wellness on wheels truck.
Results/Impact: Between June 2020 and December 2024, a total of 4,113, 856 persons were screened (98% screening coverage), 307,297 (7%) presumptive were identified with (97%) of them evaluated. A total of 24,661 TB cases (8%) were diagnosed, of this number 1710(7%) were children and 24,550 (100%) were placed on treatment across all the interventions.

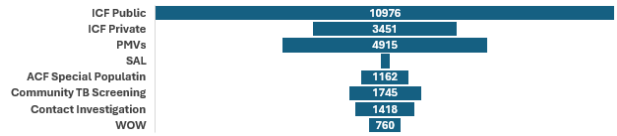

Fig1: TB Case contribution by Intervention.

Since introduction of the project in Bauchi state, a consistence increase in TB case notification has been observed from 4430 in 2020 to 14083 in 2024 representing a 318% increase.
Conclusions: The project has successfully demonstrated an innovative model to improve TB case finding in poor communities and hard-to-reach populations, thereby improving the overall TB case notification in the State.

EP16-850-19 Optimizing TB active case finding in Nigeria: Comparative analysis of screening models across four States

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Background and challenges to implementation: Nigeria's TB Active Case Finding (ACF) strategies vary widely across states in scope and efficiency. With limited public health resources, understanding which models deliver the highest yield is critical for national program optimization. This paper compared TB ACF implementation models in four Nigerian states—Kaduna, Kogi, Niger, and the Federal Capital Territory (FCT)—and identified approaches that balance scale, efficiency, and resource use.
Intervention or response: A retrospective review of ACF data from January to December 2024 was conducted. Data from each state were analyzed for total individu-

als screened, presumptive cases evaluated, TB diagnoses made, and number of community TB health workers (CTHWS) deployed. Descriptive statistics and inferential tests (ANOVA, Pearson's correlation, and linear regression) were performed to assess inter-state differences and predictors of diagnostic yield.

Results/Impact: Four distinct models emerged:

1. Kaduna (High-Volume High-Yield): Screened 226,133 individuals and diagnosed 11,848 TB cases (yield: 9.3%). Strong correlation (r = 0.95) between presumptive evaluations and diagnoses, with quarterly improvements and an average of 115 CTHWS.
2. Kogi (Precision-Targeted): Highest diagnostic efficiency (10.2% yield), screening 63,382 and diagnosing 5,029 cases with a mean of only 48 CTHWS.
3. Niger (Inefficient Scale): Despite screening 229,632 individuals, only 5,083 cases were diagnosed (yield: 7.6%), with a consistent 150 CTHWS indicating possible inefficiencies ($p < 0.01$ vs. Kaduna/Kogi).
4. FCT (Under-Resourced): Screened 23,824 and diagnosed 820 cases (7.9% yield), hampered by a sharp workforce decline from 226 to 35 CTHWS.

ANOVA confirmed significant differences in yield across states ($F = 9.87$, $p < 0.01$). Presumptive evaluations predicted 90% of diagnostic outcomes ($R^2 = 0.90$).

Conclusions: Kogi's precision model offered the highest efficiency, while Kaduna's scale model achieved the greatest absolute yield. Findings support integrated strategies that balance scale with targeting for effective ACF implementation.

EP16-851-19 Revolutionizing tuberculosis case finding in rural Nigeria: Unleashing the power of digital innovation and community engagement

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in Nigeria, with many cases going undetected. This study compares the roles of health facility-based and community-based active case-finding (ACF) strategies in increasing TB yield in Bauchi State, Nigeria. We introduce EWORS (Early Warning and Response System), a digital tool/guidance system, to determine key hotspots for screening itineraries in rural communities.

Intervention or response: The study employed a mixed-methods approach, combining facility-based TB surveillance with community-based ACF activities. We utilized EWORS to identify high-risk communities (hotspots) for TB transmission. For ACF activities, the Wellness on Wheels (WOW) mobile diagnostic truck was deployed to Tudun Wadan Daniya, a high-risk community in Bauchi metropolis. Mass sensitization, community mobilization, and collaborative efforts with local healthcare providers were implemented to enhance TB case finding.

Results/Impact: The findings demonstrate that community-based ACF activities, strengthened by facility-based TB surveillance and digital tools like EWORS, can significantly improve TB case detection. In two weeks, we screened 1488 individuals, identified 71 presumptive TB cases, and diagnosed 39 new TB cases (21 bacteriologically confirmed and 18 clinically diagnosed). All diagnosed cases were enrolled on treatment.

Attendees	Screened for TB	Presumptive identified & Evaluated	Diagnosed & notified TB cases	Bacteriological	Clinical	Enrolled on treatment
1488	1488	71	39	18	21	39

Conclusions: This study highlights the complementary roles of facility-based and community-based ACF strategies in enhancing TB case finding in rural Nigeria. The integration of digital tools like EWORS and community-based interventions can optimize TB case detection, particularly in high-risk communities. Our findings inform the development of innovative, community-focused TB control programs in resource-constrained settings.

EP16-852-19 Community-driven approach to improve tuberculosis case detection: Experience from AMAC'A', Federal Capital Territory, Nigeria

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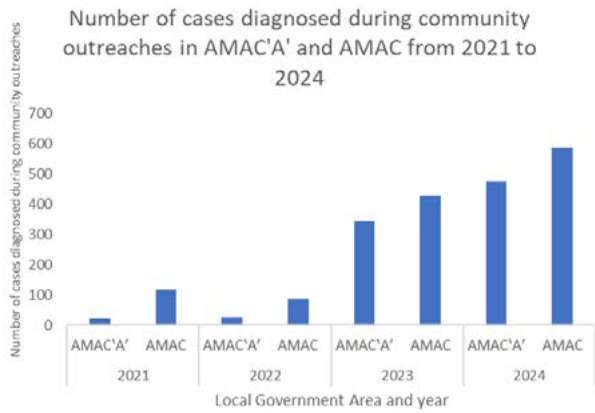
Background and challenges to implementation: Tuberculosis (TB) remains a leading public health concern globally. Without treatment, 50% of individuals with active TB may die. Nigeria ranks sixth among countries with high TB burden and holds the highest TB burden in Africa. In 2024, of an estimated 499,000 TB cases, only 405,000 were notified, leaving a gap of 94,000 undetected cases and sustaining community transmission of TB. Despite ongoing efforts, TB treatment coverage in the Federal Capital Territory (FCT) was 24% in 2024.

Intervention or response: To address the low TB case detection rate, the TB Local Government Supervisor (TBLS) of Abuja Municipal Area Council (AMAC)'A' implemented a community-based intervention. AMAC, one of six area councils in the FCT, is subdivided into five admin-

istrative units. On resumption of duty in 2022, the TBLS in AMAC'A' recruited and trained 25–30 unemployed graduates quarterly as Community Volunteers (CVs). The CVs were deployed for monthly house-to-house sensitisation and community outreaches based on hotspot mapping.

Each outreach team comprises healthcare workers of various cadres. Outreach activities include: health education, basic clinical services, sputum collection for GeneXpert testing, and contact investigation (CI). CVs receive mentoring, refresher trainings, and incentives to maintain motivation.

Results/Impact: In 2024, 27 community outreaches were conducted in AMAC'A'. In this same year, there were 3,463 presumptives and 478 TB cases diagnosed (56% were males-269/478 and 91% were adults-436/478). CI linked 403 index cases to 1,673 contact persons and 1,224 eligible contacts were initiated on TB Preventive Therapy (TPT). In AMAC'A', the CV-led strategy contributed 81% (478/587) of TB cases detected during community outreaches in AMAC and AMAC contributed to 69% (2540/3,679) of the TB cases notified in FCT.



Conclusions: The AMAC'A' CV model boosted TB case detection and TPT uptake. This scalable approach demonstrates the impact of grassroots involvement in bridging TB notification gaps.

EP16-853-19 Boosting tuberculosis case finding in Nasarawa state, Nigeria through strong partnerships with community-based organizations and community stakeholders

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Background and challenges to implementation: Tuberculosis (TB) case finding in Nasarawa State, Nigeria has remained stable over the years even though less than 70% of the TB cases in the State has been identified. This non-increase in case finding in the state is mainly because of the concentration of TB case finding activities to health facilities only.

Intervention or response: To boost TB case finding in the State, Initiative for Prevention and Control of Diseases (IPCD) with funding from the Global fund embarked on aggressive TB activities in communities in all the 13 local government areas (LGAs) of the State. Between 2021 and 2024, a total of 10 community-based organizations (CBOs) and 238 community TB workers (CTWs) were mobilized to carryout TB awareness campaigns, house to house case search and contact investigation of diagnosed TB cases in 2,067 communities in the State.

Results/Impact:

	2021	2022	2023	2024	Total
Number communities visited	215	343	507	1002	2067
Number community members screened	44800	84744	61309	108738	299592
Number presumptive TB	7356	19039	23557	19674	69626
Number TB cases diagnosed	675	1765	2234	1652	6326
Number TB cases started on treatment	675	1721	2194	1652	6242
% Contribution to State Case Finding	16%	32%	30%	21%	25%

TB Case Finding through Community TB Active Case Finding Efforts, Nasarawa State, Nigeria, 2021 - 2024.

The aggressive TB active case finding activities in the communities resulted in the screening of 299,592 community members and the identification of 69,626 of persons with presumptive TB, with 6,326 TB cases diagnosed and 6,242 cases commenced on TB treatment. These cases represent a 25% contribution of TB cases from targeted TB active case finding in the communities over a 4-year period. This contribution has resulted in the increase of TB cases in the State from 4,261 in 2021 to 7,687 in 2024.

Conclusions: Engagement of CBOs to saturate communities with aggressive TB active case finding activities can result in the detection of TB cases than would have been missed from routine passive TB case finding activities.

EP16-854-19 Early experiences from the large-scale deployment of portable digital X-rays for active TB screening in Nigeria

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Background and challenges to implementation: Nigeria has made significant strides in TB control in the past 5 years, with treatment coverage improving from 27% to 70% within this period, with concomitant reduction in TB mortality rates. In 2021, with funding from USAID, Nigeria piloted the use of ten portable digital X-rays (PDX) for TB screening with impressive results, and this has significantly improved TB case finding particularly in remote areas with limited healthcare infrastructure and expertise. With support from Global Fund, an additional 370 PDX platforms has been procured for TB screening across all states in Nigeria.
Intervention or response: KNCV Nigeria supports the NTP to ensure effective deployments of these procured platforms. Adequate planning with all relevant stakeholders, development of a National guideline for the use of PDX platforms, trainings and efficient monitoring of the deployed platforms were carried out to ensure optimal use of these procured units. Field implementation of these PDX platforms commenced in October 2024, and this has been a learning process for such large-scale deployments, with improvements made in the implementation.
Results/Impact: Of the 370 procured PDX platforms, 190 platforms were prioritized for TB case finding in hotspot communities and hard to reach locations with minimal access to TB diagnostic services. Within the firs six months of implementation, a total of 154,056 persons have been screened for TB using these PDX platforms, with 3,321 persons diagnosed with TB.

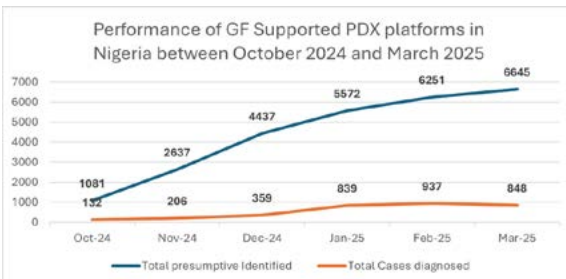

Figure-1: Presumptive and TB cases identified by PDX in Nigeria between October 2024 and March 2025.

Conclusions: The early experience using the PDX platforms in Nigeria has been rewarding as it has proven to be more efficient, sensitive, and specific than the symptom screening, with an average Number needed to screen (NNS) of 48 and number needed to test of 8. This massive deployment is a critical step toward improving TB prevention and care in the Nigeria

EP16-855-19 Experiences with chest X-ray mobile vans and artificial intelligence software in TB screening and diagnosis at hard-to-reach areas in Lagos Nigeria

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Background and challenges to implementation: WHO recommends chest X-ray (CXR) with artificial intelligence (AI) software interpretation in TB screening to improve TB case notification. In Lagos, CXR-AI has been extensively used in both public health facilities level and community TB screening, however, limited data exists on its use of mobile X-ray vans at the hard-to-reach areas in Lagos. This study investigates the utilization of CXR with CAD software within targeted outreach programs as a cost-effective strategy for early active TB case identification, particularly in hard-to-reach LGAs in Lagos like Ojo, Epe and Badagry LGAs.
Intervention or response: KNCV Nigeria supported the use of 3 mobile X-rays vans equipped with CAD software as part of the strategies for active TB case finding at the hard-to-reach LGAs. These machines were seamlessly integrated into targeted outreach programs, with screening algorithms devised to incorporate CXR alongside symptom screening for all outreach attendees. Quarterly outreaches were conducted across three designated LGAs. Clients above threshold scores of 40 were presumptive for TB, submitted sputum samples for microscopy and Xpert testing and were reviewed by clinicians, according to national guidelines.
Results/Impact: 10,396 people were screened for TB from January to December 2024, with 1,513 being presumptive for TB, yielding 328 (22% case yield) TB cases with 63% (206/328) clinically diagnosed. 314(96%) pulmonary TB cases were notified during the implementation period, being 42% higher than those notified from January to December 2023 (181 TB cases). Strong coordination with Community stakeholders and partners was key to successful implementation. Challenges included low level of logistic supports and limited funding and thus leading to seldom visits of mobile vans to hard-to-reach LGAs unlike frequent visits to proximity LGAs.
Conclusions: Use of CXR-AI was well integrated in hard-to-reach areas settings and seemed to have contributed to improved TB notification. Further interventions should consider a maximum funding for routine screening at hard-to-reach areas

EP16-856-19 Sustained impact of active community case finding on tuberculosis detection and notification trends in Benue State, Nigeria: A 13-year comparative analysis (2010–2023)

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Background and challenges to implementation: Nigeria remains a high-burden tuberculosis (TB) country, with persistent gaps in case detection. To address this, Active Community Case Finding (ACF) was introduced in Benue State in 2010 to complement Passive Case Finding (PCF) and improve early TB diagnosis. However, the long-term impact and scalability of ACF remain underexplored. This study evaluates ACF's effectiveness over 13 years, focusing on implementation challenges and outcomes.

Intervention or response: A retrospective review of TB notification data (2005–2023) from the Benue State Tuberculosis and Leprosy Control Program was conducted. The study was divided into pre-ACF (2005–2009), early ACF (2010–2017), and advanced ACF (2018–2023). Quantitative data from 2013 to 2023 were analyzed using Join-point regression to assess trends.

The study also considered high-risk groups, such as HIV-positive individuals, and the scalability of the ACF approach.

Results/Impact: Prior to ACF implementation, TB detection rates stagnated below 30 per 100,000, missing the national target. Following ACF's introduction, TB notifications increased by 50.47%, from 4,652 cases in 2018 to over 7,000 in 2023. Regression analysis revealed a significant upward trend ($p<0.05$), especially in high-burden communities like urban slums. While HIV co-infected individuals benefit from integrated screening in health facilities, ACF further identified undiagnosed TB cases in these populations. Improvements in program delivery during the advanced ACF phase (2020–2023) amplified these results.

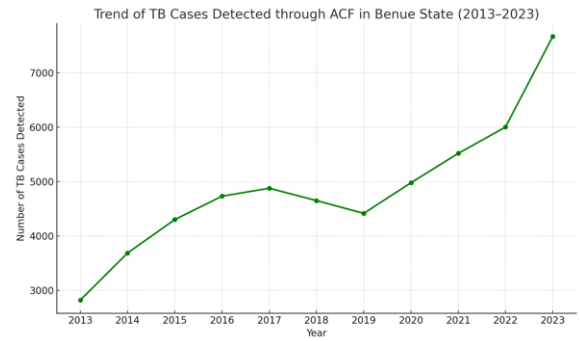

Figure 1.0: A graph showing notification trends from 2013–2023, with steady increases during the early ACF phase, a dip in 2018–2019, and a strong upward trend in the advanced phase.

Conclusions: ACF significantly improved TB case detection in Benue State. To sustain these gains, integrated co-funding, community-led surveillance, and innovations like AI-assisted screening are crucial. Lessons from Benue provide insights for TB control strategies in similar settings.

EP16-857-19 Eliminating missed diagnoses: Expanding TB/HIV testing for pregnant women in high-burden communities in Katsina State, Nigeria

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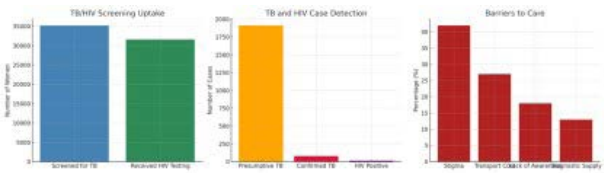
Background and challenges to implementation: Tuberculosis (TB) and HIV remain persistent public health challenges in Katsina State, Nigeria. Pregnant women are particularly vulnerable, facing elevated risks of co-infection, maternal complications, and vertical transmission. Despite availability of TB and HIV services within antenatal care (ANC), multiple barriers—including stigma, financial hardship, and limited diagnostic infrastructure—contribute to missed diagnoses. In response, the KNCV Community Public-Private Mix (CPPM) grant, supported by the Global Fund, implemented community-based active case finding (ACF) to strengthen TB and HIV screening, early diagnosis, and care linkage among pregnant women in high-burden communities.

Intervention or response: A combined retrospective-prospective cohort design was used to evaluate the program's impact. Community health workers (CHWs) conducted household visits, symptom assessments, and mobile HIV testing. TB screening employed symptom checklists, chest X-rays, and GeneXpert MTB/RIF testing. Data were gathered on screening uptake, positivity rates, treatment initiation, and barriers to service access. In-depth interviews with participants explored perceptions of community screening and health-seeking behaviors.

Results/Impact: Of the 35,225 pregnant women screened for TB, 31,612 (89%) also received HIV testing. Among them, 1912 (5%) had presumptive TB and 78 were confirmed TB-positive. HIV testing identified 14 positive cases (0.28%), some of whom had TB co-infection. Linkage to treatment was high: 94% of TB-positive and 100% of HIV-positive women were enrolled in appropriate care pathways. Reported barriers included stigma (42%), transport costs (27%), lack of awareness (18%), and insufficient diagnostic tools (13%).



Conclusions: Community-based TB/HIV screening significantly enhances early case detection and maternal health outcomes in underserved settings. Integrating mobile diagnostics and ANC-linked screening, while addressing social barriers, is critical. Government and partner-led expansion of this approach will be vital for sustaining gains and reducing maternal TB/HIV burden in Nigeria.

EP16-858-19 One goal, many paths: Transforming TB case finding through multi-sector approaches in Nigeria

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Background: Achieving TB epidemic control in high-burden countries like Nigeria requires intensified case-finding through diversified service delivery models. The USAID TB-LON 3 Project implemented a multi-pronged strategy across community, public facility, and private-sector platforms in Lagos, Ogun, Oyo, and Osun States to boost TB case detection.
Design/Methods: We analyzed TB case notification data across three key intervention areas—Community Active Case Finding (ACF), Intensified Case Finding in Public Facilities, and Public-Private Mix (PPM)—from 2021 to 2024, focusing on year-on-year performance and contributions to overall case notification increaments.
Results: Total TB notifications rose from 21,991 in 2021 to 40,690 in 2024, marking an 85% increase.

- **Community ACF** contributed significantly with a 56% rise (from 7,808 to 12,158), reflecting the success of targeted outreaches in underserved areas, including IDP camps, urban slums, and high-risk special populations.
- **Public Facility interventions** recorded a 67% increase (from 10,752 to 17,983), highlighting the impact of health worker mentorship, screening intensification, and optimized diagnostic linkages.
- **PPM interventions** achieved the most dramatic growth with a 207% increase (from 3,431 to 10,549), showcasing the effectiveness of private-sector engagement, especially among the formal and informal private providers.

Period	Year 2021 Notification	Year 2022 Notification	Year 2023 Notification	Year 2024 Notification	% Increase in Notification
ACF Community	7,808	8,054	10,158	12,158	56%
Public Facility	10,752	13,475	13,455	17,983	67%
Private Facilities	3,431	7,625	8,980	10,549	207%
Total	21,991	29,154	32,593	40,690	85%

Conclusions: The strategic expansion of TB services across community, public, and private platforms significantly improved TB case detection in Southwest Nigeria. Each modesl demonstrated unique strengths—community ACF expanded reach to hidden populations, public facility interventions improved service quality, and PPM unlocked new case pools. These results affirm the importance of integrated, multi-platform approaches for sustainable TB service scale-up and epidemic control.

EP17 Improving diagnostic yield for TB: Methods and innovations

EP17-859-19 High diagnostic yield of sputum and non-sputum tuberculosis tests in an emergency centre in Cape Town, South Africa

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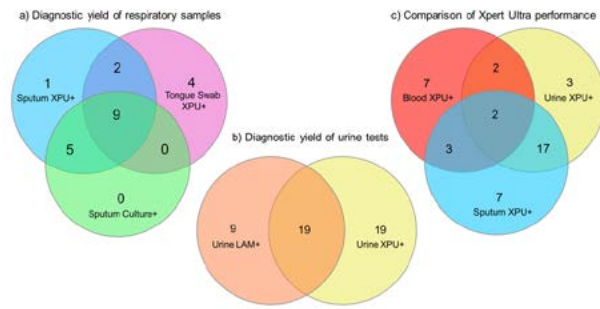
Background: Undiagnosed tuberculosis (TB) and mortality is common in people in emergency centres in South Africa, especially amongst people living with HIV (PLHIV). Prospective data on the yield of non-sputum tests are needed, including incremental benefits in the context of strengthened sputum collection efforts.
Design/Methods: We enrolled adults (≥18 years) with TB symptoms or risk factors (PLHIV, previous TB, close contacts) presenting to an emergency centre in Khayelitsha, Cape Town.
We compared diagnostic yields of respiratory (sputum: Xpert MTB/RIF Ultra (XPU), culture, tongue swabs: (XPU), urine (AlereLAM, XPU) and blood (XPU) tests and did a head-to-head XPU comparison across specimen types.
Results: Among 266 participants, 114 (43%) had ≥1 positive test. 69/114 (61%) were routinely diagnosed (44, 3, 3, and 11 exclusively positive on sputum, urine AlereLAM, blood culture, and other extrapulmonary samples respectively; 11 positive from multiple sample types). 45/114 (39%) were identified exclusively through study testing (5 sputum-, 14 urine-, 10 blood-, 2 tongue swab-positive, 14 positive by multiple tests). Sputum was routinely collected in 147/266 (55%). The study obtained expectorated sputum from an additional 57, of whom 12/57 (21%) were positive. Routine invasive sampling (lumbar puncture, thoracentesis, pericardiocentesis) led to 13 positive diagnoses; 7 of which were also diagnosed using non-invasive study tests, suggesting invasive sampling could be reduced.
Amongst study tests, of 21 positive respiratory samples, 4 (19%) were exclusively tongue swab-positive. Of 47 urine-positives, 9 (19%) were AlereLAM-positive alone, and 19 (40%) urine XPU-positive alone. Among 41 XPU-positive cases, 7 (17%) were exclusively blood-positive (Figure).

Figure 1: Maximizing diagnostic yield of sputum and non-sputum-based testing



Conclusions: Our findings underscore the high TB burden in emergency settings, the value of multiple sputum collection attempts and the synergistic benefits of different tests on non-sputum specimens, which could reduce invasive sampling. The incremental diagnostic yield of non-sputum-based tests provides key insights for integrated diagnostic algorithms to improve treatment.

EP17-860-19 Analyzing the effect of demographic factors on Xpert positivity and cycle threshold values in tuberculosis testing

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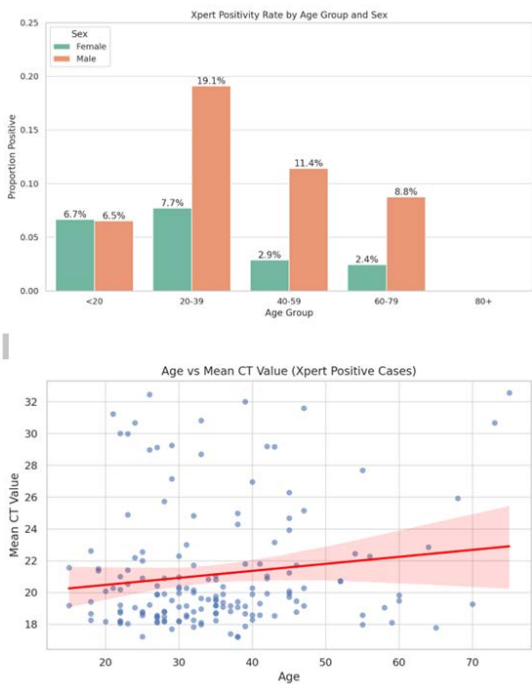
Background: Tuberculosis (TB) remains a major global health concern. The Xpert MTB/RIF assay is a widely used molecular diagnostic tool that provides rapid detection of TB and estimates bacterial load via cycle threshold (CT) values. Understanding how demographic factors influence Xpert positivity and CT values may guide effective TB screening strategies.
This study seeks to explore the effect of age and gender on Xpert positivity and CT values among individuals tested for TB..
Design/Methods: A cross-sectional approach was utilized to enroll 1,705 consented participants across three health facilities. Sputum samples and demographic data were collected. Xpert MTB/RIF test was performed on sputum samples, and results including CT values for five

genetic probes were documented. Xpert positivity rates were compared across age groups and gender. While linear regression analyzed the relationship between age and CT values among positive cases.

Results: Out of the 1,705 samples analyzed, Xpert positivity was significantly higher among males ($p < 0.001$), particularly those aged 20–39. Positivity rates decreased with age, with the lowest rates observed in females aged 60 and above. No significant difference was found in CT values between males and females ($p = 0.15$). A weak positive correlation ($r = 0.14$) between age and mean CT value was observed among positive cases, suggesting a lower bacterial load in older individuals.



Conclusions: Gender and age significantly influence Xpert TB positivity rates, with young adult males showing the highest risk. CT values, however, remain consistent across demographics. These findings support the need for age- and gender-targeted TB screening strategies to enhance early case detection and resource allocation in high-burden settings

EP17-861-19 Who, what, and how much: Sputum scarcity amongst people requiring tuberculosis testing across multiple countries

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Background: Tuberculosis (TB) diagnostic evaluation often excludes people who cannot naturally produce sputum (sputum-scarce), yet their prevalence, characteristics, and impact on test performance remain poorly understood.

Design/Methods: We analysed adults with presumptive pulmonary TB enrolled in a multi-country diagnostic study (Cohort A, n=2224), studies in South Africa with similar eligibility criteria (Cohort B, n=2179), and unselected antiretroviral therapy (ART) initiators irrespective of respiratory symptoms (Cohort C, n=297). All participants were required to give at least two sputa for Xpert MTB/RIF or Xpert MTB/RIF Ultra (Ultra) and MGIT960 culture, and information on whether people could naturally make sputum (expectorate) or required sputum induction was recorded.

Results: Sputum-scarcity was observed in 13% (618/4700) of participants. Female sex [(adjusted odds ratio (aOR): 1.57 (95% confidence interval (CI): 1.02, 1.86); p<0.001], recruitment site [aOR: 1.05 (1.00, 1.12); p=0.031] and TB-positive individuals on ART [aOR: 2.78 (1.02, 5.53); p=0.044] were positively associated with sputum-scarcity, whereas smoking [aOR: 0.58 (0.46, 0.74); p<0.001], previous TB [aOR: 0.78 (0.63, 0.96); p<0.014], night sweats [aOR: 0.51 (0.43, 0.61); p<0.001], and low TBscoreII [aOR: 0.66 (0.56, 0.79); p<0.001] were negatively associated. Among confirmed TB cases, 12% (96/830) were sputum-scarce. The sensitivity and specificity of Ultra were lower among sputum-scarce participants [73% (54, 88) vs. 89% (84, 93); p=0.035 and 99% (98, 99) vs. 100% (99, 100); p=0.111], respectively.

Conclusions: Sputum-scarce people are more likely to be female, TB-positive individuals on ART and individuals with lower disease burden. Sputum scarcity demonstrates significant geographical variation and has a significant impact on diagnostic accuracy. These findings highlight the need for an extra effort and alternative TB diagnostic strategies.

EP17-862-19 Enhancing tuberculosis microscopy diagnosis and external quality assurance using telepathology in Kenya: A case of Meru County

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Background and challenges to implementation: Meru County is among top three TB high burden Counties in Kenya having reported 3,995 new patients in 2024, 70% of which were bacteriologically confirmed. The Kenya TB Guideline recommends molecular diagnosis as the first test, with follow-up microscopy for confirmed patients to monitor treatment. It also recommends Drug-resistant TB patients to have monthly microscopy follow ups as well as Quarterly TB microscopy EQA through blinded slide rechecking.

However, traditional microscopy faces challenges such as limited access to qualified microscopists, delayed results, and diagnostic errors. Telepathology offers an innovative solution, improving diagnostic accuracy by connecting health facilities with expert microscopists remotely.

Intervention or response: In February 2025, Meru Teaching and Referral Hospital, in partnership with Meru University of Science and Technology, piloted telepathology integration into TB diagnosis by re-analyzing 76 follow-up smears from Quarter 4 of 2024. High-resolution images were transmitted to centralized microscopists for review in order to assess telepathology's potential for diagnosis and microscopy EQA.

Results/Impact: Results reviewed that smear thickness 77%, size 62%, evenness 69% and result accuracy 100%. CAPA was instituted and prompt EQA feedback provided to facilities in real time while enhancing objectivity in quality assessments.

Conclusions: Telepathology in TB microscopy diagnosis and EQA re-checking enhances diagnostic accuracy, supports professional development, and strengthens global TB control efforts, ensuring more reliable diagnosis and improved TB case detection and management and can be applied in Kenya.

EP17-863-19 Incremental yield of the addition of tongue swab to sputum molecular testing for tuberculosis in South African adult primary healthcare clinic attendees

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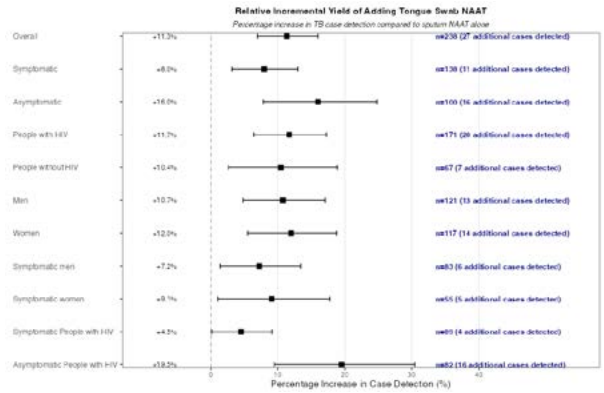
Background: Sputum molecular testing is the WHO-recommended first-line diagnostic for pulmonary tuberculosis, but sputum can be challenging to collect and poses nosocomial transmission risks. Tongue swabs' ease of collection could expand TB testing access and increase diagnoses, despite lower sensitivity.

Design/Methods: Adults with TB risk factors (living with HIV [PWH], recent TB history, TB contact) from ten South African primary healthcare clinics in three provinces had sputum and tongue swab collected, irrespective of symptoms. Sputum was tested on either Xpert MTB/RIF Ultra ('Ultra'), MAX MDR-TB, or Cobas MTB, and tongue swabs with Ultra.

The primary outcome was incremental yield of tongue swab as an add-on test to sputum, defined as the percentage of additional individuals with TB detected when using both sputum and tongue swab tests compared to sputum alone.

Results: Among 7,940 participants (78% PWH, 25% reported TB symptoms), 96% were able to expectorate sputum. Valid results were available from 85% of sputum specimens versus 97% of tongue swabs ($p<0.001$). Overall, 265 (3.3%) individuals were diagnosed with TB, 100 (1.3%) by sputum only, 138 (1.8%) by both methods, and 27 (0.3%) by tongue swab only. The incremental yield of tongue swab in addition to sputum was 11.3% (95% CI 7.0%-16.1%), this varied non-significantly by province with the most prominent increase of 30% seen in KwaZulu-Natal. The overall number needed to test to identify one additional individual with TB is 294 (202 – 428).



Conclusions: The incremental yield of adding tongue swab to standard of care sputum molecular testing was modest though non-significant regional variation existed. Tongue swab testing may still be of benefit in high prevalence communities and settings where sputum collection is challenging. Implementation research should study use cases for tongue swabs to screen and test for TB in populations currently missed by sputum-based testing.

EP17-864-19 Use of TB-LAMP assay for active case finding of pulmonary tuberculosis in Nepal

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Background: As only half of estimated TB cases are registered in Nepal, symptomatic screening as active case finding (ACF) has been carried out in 42 out of 77 districts in the country. In addition, Xpert MTB/RIF has been introduced and expanded nationwide. As a result, the number of sputum test significantly increased. However, smear microscopy is a still most commonly used tool and overall smear positivity has been reduced from 8.6% to 3.3% in the last 7 years.
In this situation, this study aims to evaluate the loop mediated isothermal amplification for TB(TB-LAMP) to compare diagnostic yield rate of pulmonary TB with smear microscopy.
Design/Methods: Participants in the study were presumptive TB patients detected separately by symptomatic screening and chest X-ray screening regardless of symptoms. Smear microscopy and TB-LAMP assay were performed using Xpert MTB/RIF Ultra as the microbiological reference standard assay.
Results: A total of 1231 presumptive TB patients were enrolled in the study from January 2024 to January 2025. More than half of presumptive TB patients were male (56.4%) and more than half (55.4%) were age of 45 or over. Out of them, 800 completed smear microscopy, TB-LAMP and Xpert Ultra assay.
Positivity of each test was 3.9%, 9.9% and 13.1%, respectively. When compared with Xpert Ultra as the reference, sensitivity of smear microscopy and TB-LAMP was 28.6% (95% CI 20.8-37.8) and 73.3% (95% CI 64.2-80.9), respectively.
The specificity, positive predictive value (PPV), negative predictive value (NPV) and kappa value were 99.9% (95% CI 99.2-100), 93.8% (95% CI 79.9-98.3), 90.2% (95%CI 87.9-92.1), 0.41 (95% CI 0.38-0.44) and 99.7% (95%CI: 99.0-99.9%), 97.5% (95%CI: 91.2-99.3), 96.1% (95%CI: 94.4-97.3), 0.82 (95% CI 0.78-0.85), respectively.

		Xpert Ultra	Xpert Ultra	
		Positive	Negative	Total
Smear microscopy	Positive	30	1	31
	Negative	75	694	769
TB-LAMP	Positive	77	2	79
	Negative	28	693	721
Total		105	695	800

Table Agreement between smear microscopy, TB-LAMP and Xpert Ultra assay.

Conclusions: TB-LAMP showed higher sensitivity and would replace smear microscopy effectively in ACF. Cost-effectiveness study should be done to ascertain the applicability of TB-LAMP in Nepal.

EP17-865-19 Evaluating optimal functionality of the GeneXpert machine as a point-of-care diagnostic tool for tuberculosis in Nigeria: Lessons from KNCV, Cepheid Authorized Service Provider

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Background and challenges to implementation: Nigeria bears one of the world's highest tuberculosis (TB) burdens, making accurate and timely diagnosis is critical for TB control. The GeneXpert MTB/RIF or Ultra assay facilitates rapid detection of Mycobacterium tuberculosis and rifampicin resistance within 70 minutes.

However, effective nationwide deployment requires robust technical support, trained users, and adequate infrastructure elements often lacking in resource-limited settings.

Intervention or response: In 2014, Cepheid appointed KNCV Tuberculosis Foundation as the Authorized Service Provider (ASP) in Nigeria. Initially supporting fewer than 100 GeneXpert machines, KNCV now oversees over 540 systems. Key Interventions include:

- Routine and on-demand training for end users
- Troubleshooting support, annual calibrations, and preventive maintenance.
- A network of trained "super-users" providing decentralized technical assistance.
- Facility level mentorship to advocate for infrastructure improvement, including ventilation, air conditioning, and power stability.

Results/Impact: Service data and user feedback revealed that many machine failures resulted from end user errors, including inadequate cleaning of cartridge bays and filters, mishandling of cartridges, and poor adherence to standard operating procedures (SOPs).

Additionally, Infrastructural deficiencies such as poor ventilation, non-functional air conditioning, and unreliable power supply has led to overheating, test interruptions, and sample loss.

The deployment of super-users and the implementation of responsive service protocols significantly reduced machine downtime and improved overall reliability.

KNCV's approach underscores the interconnected role of user behavior, technical competence, and environmental readiness in sustaining diagnostic performance.

Strengthening decentralized support structures, continuous user training, and enhanced collaboration with facility management have been pivotal in improving machine uptime and diagnostic reliability.

Conclusions: KNCV's decentralized, capacity-building model offers a scalable solution for sustaining GeneXpert performance in Nigeria. Continued investment in training and infrastructure is essential to maintaining diagnostic effectiveness and supporting national TB seeking sustainable solutions to optimize TB diagnostics.

EP17-866-19 Evaluating the cost-effectiveness of integrating TB LAMP and GeneXpert for tuberculosis diagnosis in Kaduna State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) is a major public health concern in Nigeria, with approximately 467,000 cases reported in 2023. As one of the top 30 high-burden TB countries, Nigeria accounts for 87% of global TB cases. Limited diagnostic coverage and a 70% funding shortfall exacerbate the problem. GeneXpert, while effective, is costly and requires stable infrastructure, which is often lacking in rural areas. To address this, Nigeria adopted a revised diagnostic algorithm, using TB LAMP as the primary screening tool, reserving GeneXpert for confirming rifampicin resistance in positive cases. TB LAMP is more affordable ($5 vs. $10) and suitable for low-resource settings.

Intervention or response: In 2024, KNCV Nigeria, in collaboration with the National Tuberculosis, Leprosy and Buruli Ulcer Control Programme (NTBLCP), deployed TB LAMP in six primary healthcare facilities in Kaduna State. Under the new algorithm, all presumptive TB cases were initially tested with TB LAMP, with only positive results undergoing further GeneXpert testing for drug resistance. Laboratory staff were trained, and results were documented using national TB reporting tools.

Results/Impact: Between January and June 2024, a total of 2,145 presumptive TB samples were tested using TB LAMP, identifying 358 positive cases. These cases underwent additional testing with GeneXpert. The combined testing strategy cost $14,305, compared to $21,450 if GeneXpert had been used for all samples, resulting in a savings of $7,145 (33%).

Month	January	February	March	April	May	June	Total
Presumptive evaluated	330	300	408	252	390	465	2145
Positive cases diagnosed	55	52	58	45	79	69	358

Conclusions: Using TB LAMP as the primary diagnostic tool reduces costs while maintaining quality. It is recommended for high-burden, resource-limited settings and should be scaled nationally to improve diagnostic coverage and optimize funding.

EP17-867-19 A prospective multicentre diagnostic accuracy study of the Truenat MTB Plus/COVID-19 assay for simultaneous detection of TB and COVID-19

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Background: The COVID-19 pandemic led to disrupted TB management. Overlapping symptoms, radiological findings and risk factors made differentiating TB and COVID-19 disease difficult. These challenges highlight the need for integrated testing strategies. The TruenatTM MTB-Plus/COVID-19 assay was developed to address this diagnostic gap.
Design/Methods: This was a prospective multicentre diagnostic accuracy study for the Truenat MTB-Plus/COVID-19 assay, using a combined sputum plus nasopharyngeal swab specimen for evaluation in a single multiplex assay.
Participants were adults with presumptive TB enrolled from Uganda, Peru, South Africa, and India between October 2022 and December 2023.
A microbiological reference standard of sputum GeneXpert Ultra and TB culture was used for TB, whereas national RT-PCR was used as a reference standard for COVID-19. Wilson's score method was used to determine the sensitivity and specificity.
Results: Of the 1928 participants enrolled, the median (IQR) age was 37 years (27-50), 359/1928 (18.6%) previously had TB, and 287/1928 (14.9%) were HIV-positive.
The overall prevalence of TB was 24.8% (476/1920) [95% CI 22.9-26.8%].
Prevalence of COVID-19 was 3.8% (73/1910) [3.1-4.8%] overall, and 4.7% (22/470) [3.1-7%] in those with confirmed TB.
Overall sensitivity of Truenat MTB-Plus/COVID-19 against TB was 79.8% (380/476) [CI 76.0-83.2%]. When comparing paired sampled, Truenat MTB-Plus/COVID-19 had a 9.5% (CI 6.5-13.1%) decrease in sensitivity against sputum TB culture compared to Xpert Ultra (82.8% [78.9-86.1%] vs 92.4% [89.4-94.5%], respectively).
Overall specificity of Truenat MTB-Plus/COVID-19 for TB was 98.9% (1428/1444) [CI 98.2-99.3%].
For COVID-19 detection, the overall sensitivity of Truenat MTB-Plus/COVID-19 assay compared to national site-specific RT-PCR was 64.4% (47/73) (52.9-74.4%), with specificity 99.2% (1814/1829) (CI 98.7-99.5%).
Conclusions: Although optimal diagnostic performance was not demonstrated, the potential for rapid development of tests that integrate TB diagnosis with detection of other relevant respiratory infections is highlighted.

EP17-868-19 Improving performance and efficiency through digital platforms: The Accelerated Implementation Methodology (AIM 250) experience in Kano State, Nigeria

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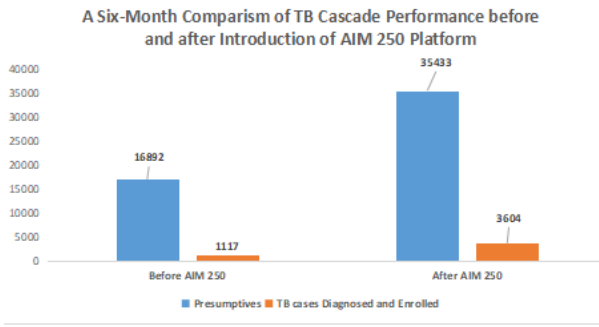
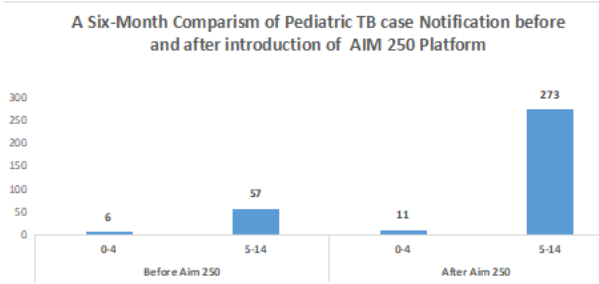
Background and challenges to implementation: The strength of a health system and ultimately the health of a population depends to a large degree on health worker performance. However, insufficient support to build, manage and optimize human resources for health in low- and middle-income countries results in inadequate health workforce performance, perpetuating health inequities and low-quality health services. We present result showcasing use of a digital platform in improving performance and supervision efficiency in Kano State.
Intervention or response: KNCV Nigeria implements the Global fund cycle 7 grant in Kano across 40 local Government Areas. In September 2024, AIM 250 digital platform was introduced to track key performance indicators, and ensure supervision to sites are being maximized. Open Data Kit (ODK) are filled on weekly and monthly basis to ensure compliance, a feedback system is sent on every Tuesday to review performance. Data was analyzed when AIM250 was not introduced Vs when it was introduced.
Results/Impact: From April to September 2024, 16,892 presumptive TB cases were identified and evaluated, leading to the diagnosis and enrollment of 1,117 TB cases. In October, the AIM 250 platform was introduced to enhance performance tracking, resulting in a remarkable increase in TB detection.From October to March the number of presumptive TB cases surged to 35,433 Presumptive TB with 3,604 cases diagnosed and enrolled, representing a 48% increase in presumptive identification and a 31% rise in TB diagnoses.
Additionally, childhood TB notification saw a significant improvement, rising from 63 to 283 cases, marking a 22% increase in pediatric TB case detection





Conclusions: Result shows significant improvement in key performance indicators following the introduction of AIM 250. This digital platform has proven effective in enhancing performance through structured weekly and monthly feedback mechanisms, addressing field implementation challenges. We recommend scaling up AIM 250 for broader implementation integrating it with existing health information systems in the country.

EP18 PLHIV - the continuum of TB care (prevention, diagnosis, treatment and post-treatment)

EP18-869-19 Universal TB testing with simultaneous TPT prescribing among people living with HIV in South Africa

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Background: South African guidelines recommend targeted universal testing for tuberculosis (TUTT) for people living with HIV (PWH) starting antiretroviral therapy (ART). Modeling suggests that TUTT with simultaneous TPT (TUTT-PT), irrespective of TB symptom status, may reduce TB disease and death. We evaluated whether the TUTT-PT approach could increase TPT prescribing while not causing potential harms from provision of TPT to people with TB disease.
Design/Methods: We conducted a pilot evaluation of TUTT-PT in 5 clinics (3 intervention, 2 standard of care) in North West province, South Africa. In all clinics, a study nurse conducted a clinical evaluation with enrolled adult PWH starting or re-starting ART. In intervention clinics, an algorithm informed study nurses of whether to recommend TPT. Participants with severe TB symptoms (hemoptysis and/or fever) or specific contraindications were not recommended to receive TPT. Clinic nurses made the final TPT prescribing decision.
Results: Overall, 413 PWH were enrolled; 213 at intervention clinics and 200 at control clinics. The median (interquartile range) age was 37 (30, 45), 55% were female, and 32% had ≥1 TB symptom. TB testing was higher in intervention (99%) vs control (62%) clinics and, after excluding a one-month TPT stock-out period, TPT prescribing within 7 days of ART was also higher (intervention: 86%; control: 71%). Fifteen participants who started TPT were diagnosed with TB (10 intervention, 5 control); 8 switched to anti-TB treatment ≤7 days of sputum collection and 4 switched >7 days; 1 died, 1 withdrew, and 1 was hospitalized).
Conclusions: We achieved a high level of TB testing and TPT prescribing using the TUTT-PT approach, with successful switch from TPT to TB treatment in both arms for people diagnosed with TB disease. Routine rollout of a TUTT-PT approach could substantially increase TPT prescribing and decrease TB disease. A larger clinical trial should be considered.

EP18-870-19 Effect of secondary tuberculosis preventive therapy on posttreatment outcomes of people with HIV in Uganda

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Background: Recurrent tuberculosis (TB) accounts for a substantial proportion of TB incidence among people with HIV (PWH) in high prevalent settings.
World Health Organisation (WHO) supports posttreatment or secondary TB preventive therapy (sTPT) for all PWH to prevent recurrence. In Uganda, a recent national campaign to scale-up TPT included sTPT for all PWH successfully completing TB treatment. We evaluated whether sTPT improves post-treatment outcomes of PWH
Design/Methods: From November 2020 to January 2023, we enrolled consecutive adults presenting to four clinics in Uganda for antiretroviral therapy (ART) initiation in a randomized trial comparing two WHO-recommended TB screening strategies (NCT04557176). Routine clinicians decided whether to initiate sTPT among participants completing treatment for TB. We compared individual characteristics and posttreatment outcomes among trial participants who received sTPT vs. no sTPT.

Table. Clinical characteristics and posttreatment outcomes of PWH, by sTPT status.

Demographic and clinical characteristics	sTPT[1] (n=154)	No sTPT (n=96)	p-value
Female sex	63 (41%)	38 (40%)	0.84
Age (median years [IQR])	35 (29-40)	35 (29-39)	0.66
Pre-ART CD4 count (median cells/uL [IQR])	107 (56-200)	115 (54-218)	0.69
Microbiologically-confirmed TB (initial episode)	102 (66%)	51 (53%)	0.04
Posttreatment outcomes			
TB recurrence and death	7 (5%)	6 (6%)	0.56
TB recurrence[2]	4 (3%)	1 (1%)	0.39
Died[3]	3 (2%)	5 (5%)	0.15
Time-under-observation (per 100 person-years)	2.19	1.8	
Incident rate of TB recurrence and death (per 100 py)	3.2 (95%CI: 1.5-6.7)	5.1 (95%CI: 2.3-11.3)	0.40[4]

[1]sTPT regimen (101 received IPT, 53 received 3HP); [2]TB recurrence was microbiologically-confirmed for 2 of 4 sTPT recipients and 0 of 1 non-recipients; [3]Cause of death attributed to active TB for 2 of 3 sTPT recipients and 2 of 5 non-recipients); [4]p-value for incident rate ratio.

Results: Of 1,719 total participants, 250 completed standard TB treatment, of whom 154 (62%) initiated sTPT. There was no difference in sex, median age, and median pre-ART CD4 cell-count by sTPT status (Table). However, participants who received sTPT were more likely to have microbiologically-confirmed TB (urine lipoarabinomannan- or sputum Xpert MTB/RIF Ultra-positive) than participants who did not receive sTPT (66% vs 53%, p=0.04). Four sTPT recipients (1%) developed recurrent TB and three (2%) died, versus one (1%) and five (5%) sTPT non-recipients, respectively. The adjusted incidence rate ratio of recurrent TB and mortality combined was 0.63 (95% CI: 0.2-1.9).
Conclusions: In Uganda, a country with high TB/HIV burden, routine sTPT did not improve posttreatment outcomes of PWH initiating ART who successfully completed TB treatment. Given the resource requirements of sTPT (e.g., drug costs, clinic workload), these resources may be more efficiently re-allocated to other TB control activities.

EP18-871-19 Kynurenine-to-tryptophan ratio is a suitable blood-based screening tool for active tuberculosis in pregnant women living with HIV

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Background: For pregnant women living with HIV (PwLHIV), concurrent tuberculosis (TB) increases the risk of miscarriage, as well as maternal and infant mortality. Recently, we reported that K/T ratio is a suitable blood-based TB test in adults, children and PwLHIV. Indoleamine 2,3-dioxygenase (IDO) breaks down tryptophan into kynurenines, and IDO activity mediates fetal-maternal tolerance at the placenta. We investigated whether the stage of pregnancy affects the use of IDO activity as a screening tool for TB disease in PwLHIV. Additionally, we assessed IDO activity as a marker of isoniazid preventive therapy (IPT) response among PwLHIV during pregnancy or the postpartum period.
Design/Methods: We measured plasma kynurenine and tryptophan concentrations in PwLHIV enrolled in TB APPRISE by ELISA. TB APPRISE enrolled PwLHIV during second trimester and followed them until 44 weeks postpartum. Participants were randomized to receive IPT either during the antepartum or postpartum period. Six women developed TB at antepartum. IDO activity was calculated as the Kynurenine:Tryptophan (K/T) ratio.

Results: There was no significant difference in K/T ratio measured in the second trimester compared to third trimester of pregnancy (median, 0.106 [interquartile ranges (IQR) 0.077-0.138] versus 0.096 [IQR 0.062-0.133], P < 0.6098). K/T ratio significantly decreased in all women at postpartum compared to the antepartum period (median 0.135 [IQR 0.106-0.175] versus 0.033 [IQR 0.028-0.042], P < 0.0001). Pregnant women who received IPT during pregnancy exhibited decreased K/T ratio compared to those who received IPT at postpartum period (P = 0.0074). In postpartum period, plasma K/T ratio was elevated in women who developed TB at the time of diagnosis compared to controls (P < 0.0001).
Conclusions: Our results show no variation in plasma K/T ratio during pregnancy but significant decreases in postpartum period among PwLHIV. Plasma K/T ratio should be further evaluated as an initial TB screening test to assess its impact on patient care.

EP18-872-19 Diagnostic accuracy of point-of-care ultrasound for tuberculosis disease among inpatients with HIV: A prospective cohort study in Ghana

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Background: Timely detection of HIV-associated tuberculosis (TB) is challenged by non-specific symptoms and a high prevalence of paucibacillary and extrapulmonary disease. Point-of-care ultrasound (POCUS) may support early TB diagnosis. This study assessed the diagnostic accuracy of POCUS features for TB among inpatients with HIV.
Design/Methods: This prospective study was conducted at Korle Bu Teaching Hospital, Ghana (Jan 2020–Jan 2022, NCT04122404), enrolling inpatients with advanced HIV or symptoms suggestive of TB. Study procedures included POCUS, clinical assessment, and TB testing with 8-week follow-up. POCUS assessment of the heart, lungs, and abdomen for signs suggestive of TB were performed as index test. Diagnostic accuracy was evaluated against 8 weeks composite reference standard (CRS) including microbiologically confirmed (eMRS) and clinical TB. Primary outcome was the accuracy of individual and combined POCUS features against CRS. Secondary analyses included associations between POCUS features and 8-week TB status.
Results: Among 107 patients (median age: 42 years (IQR 34-51), 56.1% female, 45.8% newly diagnosed with HIV) TB prevalence ranged from 47.0% (47/100, eMRS) to 56.1% (60/107, CRS). Having any effusion (pericardial, pleural or ascites) was commonly observed (78/107, 72.9%), however unspecific for TB (Table 1 against CRS).
Complex pericardial effusion (6/107, 5.6%) and severely impaired left ventricular function (8/107, 7.6%) had moderate rule-in value for TB.
Pneumothorax and complex ascites were uncommon (3/107, 2.8%, respectively) but 100% specific for TB. The FASH and FLUS protocols detected 75.0% and 81.7% of TB cases respectively, but had low specificity.
A combination of either complex pericardial effusion, severely impaired LV function, pneumothorax, or complex ascites had strong rule-in potential (sensitivity 25.0%, specificity 93.6%) and an adjusted OR of 5.49 (95% CI 1.42–21.22) for TB.

POCUS features	POCUS positive n=107 (CRS+ n=60 / CRS− n=47)	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	PLR (95% CI)	NLR (95% CI)
Complex pericardial effusion (presence of septations/ fibrin strands)	6 (5/1)	8.3 (2.8-18.4)	97.9 (88.7-99.9)	83.3 (35.9-99.6)	45.5 (35.6-55.8)	3.92 (0.47-32.40)	0.94 (0.86-1.02)
Severely impaired LV function (eyeballing)	8 (6/2)	10.0 (3.8-20.5)	95.7 (85.2-99.5)	75.0 (34.9-96.8)	44.9 (34.8-55.3)	2.30 (0.49-10.87)	0.94 (0.85-1.04)
Complex pleural effusion (presence of septations/ fibrin strands)	11 (7/4)	11.7 (4.8-22.6)	91.5 (79.6-97.6)	63.6 (30.8-89.1)	44.8 (34.6-55.3)	1.37 (0.43-4.41)	0.97 (0.85-1.10)
Pneumothorax (absence of lung sliding, absence of B-lines, and if detected, the presence of the lung point)	3 (3/0)	5.0 (1.0-13.9)	100.0 (92.5-100.0)	100.0 (29.2-100.0)	45.2 (35.4-55.3)	NA	0.95 (0.90-1.01)
Complex ascites (presence of septations)	3 (3/0)	5.0 (1.0-13.9)	100.0 (92.5-100.0)	100.0 (29.2-100.0)	45.2 (35.4-55.3)	NA	0.95 (0.90-1.01)
Any effusion (pericardial effusion and/or pleural effusion and/or ascites)	78 (46/32)	76.7 (64.0-86.6)	31.9 (19.1-47.1)	59.0 (47.3-70.0)	51.7 (32.5-70.6)	1.13 (0.89-1.43)	0.73 (0.39-1.36)
FASH (Focused Assessment with Sonography for HIV-associated TB, Heller et al.)	76 (45/31)	75.0 (62.1-85.3)	34.0 (20.9-49.3)	59.2 (47.3-70.4)	51.6 (33.1-69.8)	1.14 (0.88-1.46)	0.73 (0.41-1.33)
FLUS (14-zone focused lung ultrasound)	93 (49/44)	81.7 (69.6-90.5)	6.4 (1.3-17.5)	52.7 (42.1-63.1)	21.4 (4.7-50.8)	0.87 (0.76-1.00)	2.87 (0.85-9.71)
Any of the four best performing individual POCUS features to rule in TB (Any of complex pericardial effusion, severely impaired LV function, pneumothorax, or complex ascites)	18 (15/3)	25.0 (14.7-37.9)	93.6 (82.5-98.7)	83.3 (58.6-96.4)	49.4 (38.7-60.2)	3.92 (1.20-12.74)	0.80 (0.68-0.94)

Conclusions: Among admitted patients with HIV, complex pericardial effusion, impaired LV function, pneumothorax, or complex ascites were suggestive for TB and should prompt further investigation and early treatment.

EP18-873-19 People living with HIV have increased plasmacytoid dendritic cells and systemic inflammation if they have history of pulmonary TB

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Background: People living with HIV who have history of TB have worse outcomes, including increased all-cause mortality and risk for recurrent TB. We hypothesized that persistent immune deficits could explain these outcomes. To assess for persistent immunologic changes after TB cure in people living with HIV we sequenced peripheral immune cells to identify candidate immune cell subsets followed by confirmatory studies to investigate the relevance of these subsets.
Design/Methods: We completed Cellular Indexing of Transcriptomes and Epitopes by Sequencing (CITE-Seq) of PBMC of people living with HIV with (n=6) or without (n=3) TB history at GHESKIO Centers in Haiti. CITE-Seq analysis included differential gene expression and principle components and pathways analyses. Confirmatory studies on an expanded cohort (n=29) included dendritic cell subtyping by flow cytometry and cytokine quantification using an 18-plex Th1/Th2 panel. Twoway comparisons were with non-parametric tests and tobit regression with Bonferroni correction.
Results: There was over-representation of the Hallmark gene set, "genes regulated by NF-kB in response to TNF" in the PBMC population as well as in individual immune lineages. TNF levels were higher in the TB group (p=0.002). There were 68 differentially expressed genes in the dendritic cells with over-representation of pathways important for response to TB: response to hydrogen peroxide, oxidative stress, and reactive oxygen species. In an expanded cohort of 29 people with HIV, there was a larger percentage of plasmacytoid dendritic cells by flow cytometry (p=0.011). and increased plasma IL-6, IL-12p70, IL-15, IL-2, IFN-alpha, and TNF in the TB history group (n=18) compared to people with no history of TB (n=11).
Conclusions: A proinflammatory milieu and immune cell gene expression mediated by TNF persist in people living with HIV even years after TB. If the differences are preexisting risk factors or establish during the natural history of HIV and TB is still to be determined.

EP18-874-19 Implementing data linkage to qualify trends of unfavorable TB-HIV outcomes in Brazil (2013–2023)

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Background: Unfavorable treatment outcomes in tuberculosis (TB), such as death and loss to follow-up, remain disproportionately high among people living with HIV and AIDS (PLWHA). However, underreporting of HIV status in TB surveillance systems may lead to biased estimates. This study analyzes the impact of database linkage between TB and HIV systems on trend analysis of unfavorable outcomes among people with TB-HIV co-infection in Brazil.
Design/Methods: We analyzed national surveillance data on TB cases diagnosed between 2013 and 2023. Two datasets were compared: one using only HIV status reported in TB notifications, and another enhanced through probabilistic linkage with the national HIV/AIDS and Mortality Information Systems. Unfavorable outcomes were defined as death and loss to follow-up. Annual proportions of unfavorable outcomes among PLWHA were calculated, and trends assessed using Prais-Winsten regression.
Results: A total of 91,580 TB-HIV co-infection cases were identified through linkage, a 17.5% increase compared to the dataset without linkage. Across all years, the proportion of unfavorable outcomes was consistently higher in the linked dataset. A significant declining trend in unfavorable outcomes was observed in the linked data (–0.83 percentage points per year; $p < 0.001$). No significant trend was found in the unlinked data (–0.14 percentage points per year; $p = 0.564$), suggesting temporal stability.

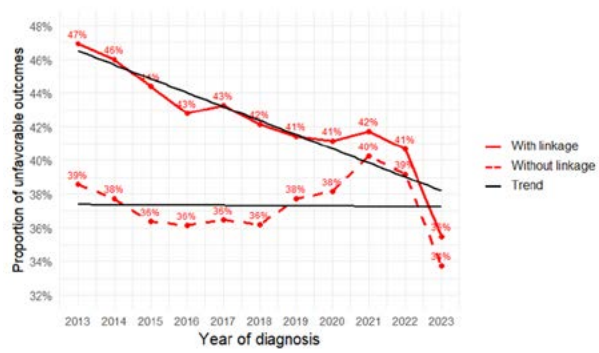

Figure 1. Proportion of unfavorable outcomes among people with tuberculosis-HIV coinfection by year, according to the use of database linkage.

Conclusions: Database linkage increased the sensitivity of TB-HIV co-infection surveillance by identifying additional PLWHA not registered in the TB national system. This integration improved the estimation of unfavorable outcomes and revealed trends not visible in isolated datasets. In contexts where health information systems remain fragmented, adopting routine data linkage is crucial to strengthen epidemiological surveillance by identifying patterns, trends, and gaps that might otherwise go unnoticed and guide more effective, targeted public health interventions.

EP18-875-19 Integrating self-care into TB-HIV management: Addressing mental health challenges for persons infected with TB-HIV co-morbidities in Kano State, Nigeria

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Background: HIV and Tuberculosis (TB) remain major public health challenges, often compounded by stigma, leading to severe mental health burdens for co-infected individuals. These challenges negatively affect social relationships and treatment adherence. This study explores the role of self-care in improving treatment outcomes for individuals with TB-HIV co-morbidities, emphasizing a person-centred approach within existing health programs.

Self-care refers to the ability of individuals, families, and communities to maintain health, prevent disease, and manage illness with or without healthcare support. This study evaluates self-care awareness among TB-HIV patients and its impact on treatment outcomes.

Design/Methods: A mixed-methods approach was employed, involving 201 participants across seven local government areas in Kano State, Nigeria, over a period of two month from October to December 2024. Quantitative data on demographics, service utilisation, and treatment adherence were collected through structured surveys. Qualitative insights were obtained via in-depth interviews with patients, healthcare providers, treatment supporters, community leaders, and CBOs. Data triangulation was used to assess barriers, facilitators, and overall program impact.

Results:

- Awareness of self-care was mixed, with 53.33% of respondents having prior knowledge. Among them, 57.14% associated self-care with self-management, while awareness of self-awareness (28.57%) and self-testing (14.29%) was lower.
- About 80% recognized the link between self-care and quality of care in health facilities, highlighting its potential for integration into TB-HIV programmes.
- Stigma and discrimination (60%) were the biggest barriers to HIV care access, followed by distance to healthcare facilities (15%).
- Self-stigma (84%) was a major mental health challenge, leading to social withdrawal and fear of status disclosure.

Conclusions: Integrating self-care into TB-HIV services is essential for improving access and mental health outcomes.

Recommendations include expanding mental health training for healthcare workers, integrating psychological support, and enhancing data collection for monitoring and evaluation.

EP18-876-19 Predictors of post tuberculosis treatment mortality among people living with HIV: An observational cohort study, Andhra Pradesh, India, 2024

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Background: Tuberculosis (TB) among People Living with HIV (PLHIV) is associated with poor treatment outcomes compared to those without HIV and has implications for TB control. India's national guidelines recommend post anti-TB treatment (ATT; 6-9 months of daily multi-drug regimen) follow-up every six months for two years from the last date of ATT. Limited data is available on post ATT mortality and predictors among PLHIV in India.

Design/Methods: We analysed secondary program data from 14 antiretroviral therapy (ART) clinics located in three high-burden districts of Andhra Pradesh. We included PLHIV aged >15 years who completed ATT successfully during January 2017–December 2021.

We followed-up for two years from ATT completion and monitored four-symptom TB screening, nucleic acid amplification test result for recurrent TB; CD4 and HIV-1 viral load for ART monitoring; TB prevention therapy (TPT) initiation start and completion for primary and secondary prophylaxis and calculated post TB treatment mortality rate (MR) per 100 person-years (PY).

We used multi-variable Cox proportional hazard models and calculated adjusted hazard ratios (AHR) to determine predictors of post TB treatment mortality.

Results: The 3,357 PLHIV meeting the inclusion criteria accounted for 5,594PY of follow-up. A total of 510 PLHIV died during follow-up (MR:9.1 per 100 PY, 95%CI:8.34-9.94). Select variables, such as HIV treatment interruption during follow-up (AHR:34.03, 95%CI: 16.-72.15), no exposure to secondary prophylaxis of isoniazid after ATT (AHR:3.84, 95%CI:3.07-4.80), HIV viral load ≥1,000 copies/ml during follow-up (AHR:2.80, 95%CI:1.97-3.99), no exposure to dolutegravir based regimen during follow-up (AHR:2.16, 95%CI:1.65-2.83), and baseline CD4 count ≤200 cells/mm3 (AHR:1.22, 95%CI:1.01-1.48), were associated with significantly higher risk of post TB treatment death.
Conclusions: ART clinic staff may focus on modifiable risk factors, such as preventing HIV treatment interruption, enabling viral load suppression, and ensuring initiation of secondary TPT to reduce post TB mortality among PLHIV.

EP19 Adult lung - burden and care of lung conditions

EP19-878-19 Clinico-radiological spectrum of respiratory post-acute COVID-19 in adults in Lusaka, Zambia: A cross-sectional study

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Background: As the COVID-19 pandemic progressed, it became evident that some individuals continued to experience respiratory symptoms post-acute illness. However, these symptoms remain poorly characterised, particularly in low-resource settings. Despite the global burden of COVID-19, data on its long-term pulmonary effects in Zambia are lacking. This study aimed to describe the clinical and radiological patterns of respiratory post-acute COVID-19 at the University Teaching Hospital (UTH) in Lusaka, Zambia.
Design/Methods: A cross-sectional study was conducted from October 2022 to May 2024 among adults attending the UTH respiratory clinic with persistent or new respiratory symptoms at least 12 weeks after acute COVID-19. 45 participants were included. Categorical variables were reported as frequencies and proportions; continuous variables as means (±SD) or medians (IQR). Associations with abnormal chest CT features were analysed using t-tests, Chi-squared, or Fisher's exact tests.
Results: 66.7% were female. The mean age and BMI were 54 years and 29 kg/m² respectively. Pre-existing comorbidities were present in 88.9% of participants. Dyspnoea (60.0%) and chest pain (48.9%) were the most common symptoms. A total of 6.7% remained on supplemental oxygen. Abnormal spirometry was found in 68.1% of patients; 54.4% had a restrictive pattern. Chest CT abnormalities included intralobular lines or reticulations (46.7%), ground-glass opacities (37.8%), filling defects (8.1%), and consolidations (4.4%). Age ($p<0.0001$), oxygen therapy during acute illness ($p=0.015$), and abnormal spirometry ($p=0.05$) were significantly associated with abnormal CT findings.
Conclusions: Older age, prior oxygen therapy, and impaired lung function increase the likelihood of radiological sequelae post-acute COVID-19..

EP19-879-19 Determinants of COVID-19 mortality and temporal trends according to the health regions of São Paulo, Brazil

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Background: To understand the pandemic, it is essential to analyze the characteristics of different regions. In São Paulo, a strategic Contingency Plan was implemented to manage the outbreak and its consequences.
This context underscores the significance of identifying the determinants of COVID-19 mortality and analyzing temporal trends in each DRS within the state.
Design/Methods: This research employs an ecological study design where data on confirmed cases and mortality due to COVID-19 were collected from February 2020 to December 2021.
In addition, social and health indicators were analyzed to understand their relationship with the determinants of the disease. The GAMLSS was utilized to identify significant determinants of COVID-19 outcomes.
Results: The analysis revealed an increase in deaths from chronic diseases alongside a decrease in the overall mortality rate from COVID-19.
Notably, there was an observed relationship between the percentage of older adults in the urban population and increased COVID-19 mortality, as well as the effect of vaccination rates.

μ	Estimate	Std. Error	t value	Pr(>|t|)	Relative Increase (%)
(Intercept)	-2,28E+00	6,71E-01	-3.391	0.000743 ***	-
V2	-1,37E+00	6,53E-01	-2.091	0.036939 *	-74,59%
V4	2,06E-04	8,38E-04	0.246	0.805826	-
V5	8,27E-02	1,69E-02	4.902	1.23e-06 ***	8,62%
V9	2,35E-02	3,57E-03	6.572	1.11e-10 ***	2,38%
V10	-9,30E-01	8,71E-01	-1.068	0.286068	-
V11	2,68E-02	4,41E-03	6.075	2.25e-09 ***	2,72%

*Table 1 - Final model adjusted to identify factors associated with COVID-19 mortality in São Paulo. *p=0.03; ***p<0.0001*
*Legend: V2= deaths from non-transmissible chronic diseases; V3= percentage of the population 0-14 years; V4= percentage of population 15-60 years; V5= percentage of population 61 or older; V9= percentage of urban population; V10= Gini index (divided by 100) and V11= vaccination (calculation of the total applied doses of the 2nd dose of the vaccine against COVID-19 divided by population *100).*

Conclusions: This study highlights the importance of a variety of factors—such as behavioral, genetic, economic, demographic, and environmental—when identifying high-risk subgroups for complications and mortality due to COVID-19. Due to the diversity of individuals and regions, implementing targeted regional policies that reflect local population dynamics and socioeconomic conditions is crucial. This research can guide future health interventions, promoting equity and addressing the diverse needs of different populations.

EP19-880-19 Influence of pneumopathy on the survival of people with COVID-19 in Brazil (2021–2024)

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Background: The interaction between viral infection and chronic respiratory diseases can exacerbate clinical severity. Therefore, the objective of this study was to analyze the influence of pre-existing pneumopathies on the survival time of individuals diagnosed with COVID-19 in Brazil between 2021 and 2024.
Design/Methods: This is a cross-sectional study. The data used in this study were obtained from the Coronavirus Panel, made available by the Brazilian Ministry of Health, covering the period from February 2021 to December 30, 2024. For the survival analysis, the Kaplan-Meier method was used to estimate the cumulative probability of survival over time for two groups (with and without pneumopathy). The comparison between the survival curves was performed using the log-rank test to determine whether there was a significant difference between the groups.
Results: The sample included 583,446 COVID-19 cases, distributed between 50.7% men and 49.3% women. In terms of age, 62.9% were aged 60 or over, 32% were aged 30-59 and 5% were aged 18-29. As for race/color, 60.2% were white, 38.7% black/brown, 1% Asian and 0.2% indigenous.
Figure 1 presents the Kaplan-Meier survival curves. In 2021 and 2023, a significant difference between the groups is observed ($p < 0.0001$), indicating that individuals with pneumopathy had a lower probability of survival over time compared to those without the condition.
However, in 2022 and 2024, the p-values were 0.83 and 0.25, respectively, indicating no significant difference between the groups in both years.

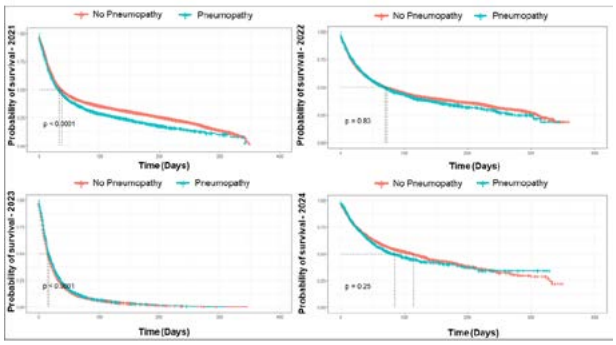

Figure 1 – Kaplan-Meier analysis of individuals with and without pneumopathy (2021-2024).

Conclusions: This study showed a significant difference in survival time among individuals who tested positive for COVID-19, comparing those who died with those who were discharged.
In addition, the presence of pneumopathy was associated with a tendency for the clinical condition to progressively worsen, resulting in a greater likelihood of death.

EP19-881-19 What is it if it's not TB? Infections causing a similar clinical picture and their morbidity and mortality

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Background: Pulmonary infections causing tuberculosis symptoms like cough or hemoptysis may be due to non-tuberculous mycobacteria (NTM), fungi, or parasites and may contribute to TB overdiagnosis or co-infection. Clinically diagnosed TB is associated with unfavourable outcomes.
This study investigated the prevalence and outcomes of non-TB infections in patients with presumed pulmonary TB in Lambaréné, Gabon.

Design/Methods: From 09/2024 to 02/2025 we enrolled consenting hospitalized adult patients with a positive WHO TB symptom screen undergoing TB evaluation (Xpert Ultra) in Lambaréné, Gabon. A questionnaire assessed medical and exposure history (TB, fungi, paragonimiasis).
Diagnostics included mycobacterial and fungal sputum cultures (SDA, 5-day incubation), stool and sputum parasitology, cryptococcal serum and histoplasma urine lateral flow antigen (LFA) tests, and HIV testing. Two-month outcomes were assessed via phone follow-up.
Results: A total of 103 participants were enrolled (median age 44 (IQR 30.5;58.5); 59% female). HIV prevalence was 29%; 19% had prior pulmonary TB. Fungal exposure was reported by 39% (most commonly: 63% excavations, 43% bat contacts), and 7% consumed raw/undercooked crabs as a risk factor for paragonimiasis.
Confirmed TB was diagnosed in 31%, clinical TB in 6%, and "NoTB" in 62%. Likely NTM were detected in 12% (of these 58% in the NoTB-group). LFAs were positive for histoplasmosis in 6% and cryptococcosis in 3% (mostly in NoTB). No paragonimus eggs were detected.
Overall 2-month mortality was 12% (12/97). In confirmed TB it was 14% (4/29), in clinical TB 0% (0/6) and 11% (7/64) in NoTB.
Conclusions: Fungal (9%) and NTM (12%) infections were frequent in presumptive TB patients and mortality in TB and NoTB exceeded 10%. Identification of cultured fungi and specific fungal PCRs (*Histoplasma, Blastomyces*) for final fungal classification are pending. Further analyses including sequencing of cultured NTM-strains, stool and sputum PCR for *Paragonimus* and metagenomics on sputum will be applied to better differentiate clinically relevant infections.

EP19-882-19 Prevalence and clinical implications of *Aspergillus* infection in a PeruvianTB cohort

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Background: Chronic pulmonary aspergillosis (CPA) is a prevalent but underrecognized form of post-tuberculosis lung disease. CPA presents with symptoms similar to those of tuberculosis (TB) and may be frequently misdiagnosed as TB. We estimated the prevalence of anti-

Aspergillus antibody positivity and CPA in a tuberculosis cohort in Lima, Peru and investigated the clinical impact of *Aspergillus* infection among those receiving TB treatment.

Design/Methods: Between October 2020 and February 2022, we enrolled and followed persons diagnosed with tuberculosis in Lima, Peru. We obtained serum samples at the time of TB diagnosis and again after 2 months of treatment and tested these for IgG antibodies against *Aspergillus* species. Participants were considered microbiologically negative for TB if their sputum smear, culture, and GeneXpert results were all negative.

Results: Among 1,998 individuals (mean age = 37.9 years, range 14-90) , 5.4% were anti-*Aspergillus* antibody positive and 4.3% met the clinical criteria for CPA at baseline. Those with positive *Aspergillus* serology were older (mean age = 54.6 years) and more likely to have a history of previous TB disease (aOR = 3.79) .

Five (0.3%) initially anti-*Aspergillus* antibody negative participants were positive at 2 months, and nine (10%) initially antibody positive participants reverted to negative serostatus. Among microbiologically negative patients, both *Aspergillus* positivity and CPA prevalence were higher at 8.1% and 6.3% respectively. Participants with positive *Aspergillus* serology showed less clinical improvement at 2 months of treatment and had lower rates of cure or treatment completion.

Conclusions: This is the largest suspected TB cohort to be evaluated with anti-*Aspergillus* serology. Our preliminary findings indicate that among those who are microbiologically negative for TB at the time of diagnosis, 6% or more may have CPA instead. CPA is an underrecognized differential diagnosis for TB and *Aspergillus* positivity may be predictive of poor response to TB treatment.

EP19-883-19 Adopting an integrated approach to lung health: A case study in Murang'a County, Kenya

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Background and challenges to implementation: In Kenya, respiratory diseases account for 25% of outpatient visits. Gaps remain in identifying at-risk TB and other lung diseases individuals. Barriers include absent integrated guidelines, siloed workflows, limited access to advanced diagnostics, inadequate healthcare worker training, and insufficient funding, resulting in missed diagnoses and reduced case detection rates. An accelerated approach is imperative in developing an integrated lung health guideline with standardized algorithms and screening protocols.

Intervention or response: The Division of TB and Other Lung Diseases in Kenya is implementing the iPACT (Integrated Program for Asthma, COPD, and TB) project in a phased approach, starting with three high-burden counties. A three-day pilot implementation was conducted in Muranga County, launched on World TB Day through community-based outreaches and two prison centers. Community health promoters mobilized the community, and symptomatic screening administered at triage. Symptomatic patients received chest X-rays using the AI-powered digital X-ray. Spirometry was used to differentiate other chronic lung diseases.

Results/Impact: A total of 1393 patients were screened, with males being 91% (1277). About 33% (464) of the total screened were symptomatic and were offered CXR with AI. Lung abnormalities detected were suggestive TB at 29% (137), lung nodules 2% (8), 21% (98) abnormal features suggestive of other lung diseases, and 15% (60) had both suggestive TB and other lung abnormalities. Spirometry tests (98) were administered to only patients with abnormal other lung diseases,13% (13) showed features of Asthma, 7% (7) COPD, 1% (1) mixed obstructive and restrictive, and 3% (3) PTLD. MTB detected were 18% (36). Patients were linked to appropriate care.

Conclusions: An integrated approach with improved screening and diagnostic workflows and tools improves early detection of TB and other lung diseases. This approach addresses diagnostic and case management gaps through comprehensive standardized protocols and optimized patient referral pathways, indicating it is an essential model with the potential for scale-up.

EP19-884-19 Metabolic disorders and clinical outcomes in AECOPD: A multi-centre cohort study

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Background: The coexistence of hypertension, diabetes, dyslipidemia, and obesity (collectively termed ‚metabolic dysfunction') is prevalent in chronic obstructive pulmonary disease (COPD) patients, yet its impact on acute exacerbation (AECOPD) outcomes remains poorly understood. We aimed to investigate the association between metabolic dysfunction and clinical prognosis in hospitalized AECOPD patients.

Design/Methods: In this prospective multi-center study, we enrolled 11,165 AECOPD patients from ten Chinese medical centers, stratified by metabolic dysfunction status (present: n=4,503; absent: n=6,662). Primary outcomes

included in-hospital mortality, ICU admission, and mechanical ventilation requirement. Cox proportional hazards models were adjusted for age, sex, BMI, and smoking status.

Results: Patients with metabolic dysfunction were older (75.2±9.7 vs 70.8±10.3 years, p<0.001), had higher BMI (23.1±4.5 vs 20.6±3.5 kg/m², p<0.001), and greater comorbidity burdens (coronary heart disease: 18.3% vs 7.3%; heart failure: 16.3% vs 8.7%; cerebrovascular disease: 9.1% vs 3.8%; all p<0.001).

After multivariable adjustment, metabolic dysfunction showed no significant association with in-hospital mortality (aHR=1.49, 95%CI:0.90-2.47, p=0.124), ICU admission (aHR=1.02, 95%CI:0.83-1.25, p=0.849), invasive mechanical ventilation (aHR=1.06, 95%CI:0.80-1.42, p=0.673), or non-invasive ventilation (aHR=1.02, 95%CI:0.89-1.16, p=0.766).

Conclusions: Metabolic dysfunction was not independently associated with short-term adverse outcomes in AECOPD patients after adjustment for confounders.

EP19-885-19 Strengthening chronic respiratory diseases detection through a targeted Moonlight Outreach in Muthurwa, Nairobi, Kenya

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Background and challenges to implementation: Kenya faces a high burden of respiratory diseases, including tuberculosis (TB), asthma, chronic obstructive pulmonary disease (COPD), and post-TB lung disease (PTLD). Limited access to screening services, especially among high-risk populations, worsens the situation. Muthurwa, a densely populated area in Nairobi, is a hotspot for respiratory diseases, particularly TB, due to overcrowded, poorly ventilated guest houses. Economic challenges and low awareness further delay healthcare-seeking. In response, a moonlight outreach was organized to provide accessible screening for chronic lung conditions and promote early detection in the community.

The outreach, held on World TB Day, targeted guest house residents living in high-risk conditions. As part of an integrated lung health initiative, it piloted a revised Integrated Algorithm for Screening Lung Conditions. This included digital chest X-rays (dCXR) with AI for diagnostics. Participants were referred for TB testing or further evaluation for asthma, COPD, PTLD, or lung cancer. A Chronic Lung Conditions Assessment Form was used to assess symptoms and comorbidities.

Intervention or response: In March 2025, the outreach was conducted over two nights. Community Health Promoters (CHPs) mobilized residents for screening using portable dCXR with AI. Clinical assessments and GeneXpert testing were conducted for symptomatic individuals. Health education on early diagnosis, treatment, smoking cessation, and prevention was also provided.

Results/Impact: A total of 336 individuals participated, with 99% (332) undergoing chest X-ray screening. Of those, 72% (239) had normal results. About 10% (33) had abnormal findings suggestive of TB and were further investigated, leading to 44% (15) being diagnosed.

Additionally, 18% (60) had abnormal X-rays suggestive of other lung conditions and were clinically diagnosed with asthma (10), COPD (12), PTLD (8), and suspected lung cancer (5).

Conclusions: The outreach enhanced early detection of chronic respiratory diseases and linkage to care. Scaling such initiatives and improving diagnostics is key to addressing respiratory disease burdens in high-risk settings

EP19-886-19 Assessing integrated lung health services in selected primary healthcare facilities (PHC) in North-Central Nigeria: Findings from a 2023-2024 pre-implementation baseline survey

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Background and challenges to implementation: In Nigeria, there is an estimated TB burden of 499,000 in 2023; 13 million estimated to be living with asthma, and pneumonia accounts for 12% of all under-five deaths annually. All three of these conditions may present with similar clinical symptoms. In North-central Nigeria, treatment coverage for TB remains low, at 62%. Given the overlap in symptomatic presentation of Tuberculosis (TB), asthma, and pneumonia and the integrated health service delivery mandate of PHC, we conducted a facility baseline assessment to identify service delivery gaps in respiratory care. We will use the information to inform our program with the intent of using an integrated care program to improve diagnosis and treatment of these three conditions.
Intervention or response: A mixed-method baseline assessment was conducted in three high-burden Local Government Areas (LGAs) in Niger State, as part of the integrated lung health EXALT project. These LGAs have a TB treatment coverage ranging from 41% to 58%. Within these LGAs, 15 PHCs were randomly selected as assessment sites. Healthcare facility data was gathered from facility registers and equipment and medicines were observed. The data was entered into Excel and analyzed using descriptive statistics. Additionally, qualitative interviews with 15 healthcare workers explored perspectives on service availability and quality.
Results/Impact: We assessed 15 health centers in Niger state. We found knowledge and resource gaps across all facilities. Major findings include: 50 to 100% of HCWs lacked training in Tuberculosis, Asthma and Pneumonia. 67% of facilities had no microscope or anti TB medicines. There were no nebulizers at any facility.
Conclusions: The assessment revealed significant gaps in case detection, knowledge and diagnostic resources. This confirms our assumptions and will help define our interventions to improve diagnosis and treatment of these conditions ultimately enhancing lung health services at PHC level.

Variables	Total N	Percentage %
Total	**15**	**100.0%**
Tuberculosis (TB)		
TB services available on site		
No	5	33.3%
Yes	10	66.7%
TB medications available on site		
No	10	66.7%
Yes	5	33.3%
TPT regimens available on site		
No	11	73.3%
Yes	4	26.7%
HCW trained in TB care		
No	7	46.7%
Yes	8	53.3%
Pneumonia		
Pneumonia services available onsite		
No	3	20.0%
Yes	12	80.0%
Pneumonia medications onsite		
No	2	13.3%
Yes	13	86.7%
HCW trained in pneumonia care		
No	13	86.7%
Yes	2	13.3%
Asthma		
Asthma services available onsite		
No	7	46.7%
Yes	8	53.3%
Asthma medication available onsite		
No	7	46.7%
Yes	8	53.3%
HCW trained in care for Asthma		
No	15	100.0%
Availability of Instrument/Tools		
Nebulizers available on site		
No	15	100.0%
Functional microscope at facility lab		
No	10	66.7%
Yes	5	33.3%
Average number of cases		
TB notified cases [Mean (SD)]	*1.6*	*2.6*
Asthma cases [Mean (SD)]	*1.7*	*4.5*
Pneumonia cases [Mean (SD)]	*1.3*	*3.7*

EP19-887-19 Factors associated with increased mortality among people with lung cancer in Tanzania and Uganda

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Background: Lung cancer is the most prevalent cancer globally and the leading cause of cancer-related deaths, accounting for 1.8 million deaths worldwide. In sub-Saharan Africa, the incidence and mortality rates are approximately 128.2 and 87.2 per 100,000 people, respectively. Mortality rates vary due to multiple factors, including HIV. Understanding these determinants is crucial for creating targeted interventions in Tanzania and Uganda. This study aims to identify factors associated with increased mortality among lung cancer patients in these countries, focusing on the impact of HIV co-infection.
Design/Methods: Individuals ≥ 18 years with biopsy-proven lung cancer were enrolled in the study since 2022. Data on sociodemographic, clinical and comorbidities,

diagnostic and treatment outcome were recorded. Kaplan Meier was used to assess for difference in survival rates by HIV status. Cox hazard proportion hazard regression analysis was done to assess factors associated with increased mortality among lung cancer patients.

Results: A total of 289(48.2%) lung cancer biopsy-confirmed patients were enrolled in the study. Majority, 157(54.3%) were under 60 years of age, 159(55%) women, 129(44.8%) peasant 207(71.8%) non-smokers and 21(7.3%)were HIV positive. Firewood/logs 138(48.08%) and charcoal 95(33.1%) were the major cooking fuels. Majority were diagnosed at stage (III and IV), and 162(56.1%) have died. From the regression analysis; stage at diagnosis, having history of smoking, progressively severity of symptoms and HIV positive were the major causes of death among these patients.

Conclusions: Late-stage diagnosis, HIV co-infection, smoking history, and worsening symptoms were key factors linked to higher lung cancer mortality in Tanzania and Uganda emphasizing the significant impact of HIV co-infection. The study highlights the need for early detection, increased awareness, and targeted interventions addressing these factors to reduce mortality. Further research is warranted to explore the interplay between these factors and to develop region-specific guidelines for lung cancer management in the context of HIV.

EP19-888-19 Detection to neglect: Gaps in care for non-TB lung conditions revealed by integrated chest X-ray screening in underserved communities in Nigeria

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Background: Nigeria is ranked sixth among the 30 high-burden countries for tuberculosis and continues to face the high burden of Chronic respiratory diseases (CRDs) and cardiovascular diseases (CVDs), with gaps in early detection, management options, and data showing ongoing transmission and sustained incidence, especially in underserved, rural communities.

Therefore, an integrated, decentralized, and culturally sensitive approach to screening and care is needed to address this public health challenge.

Design/Methods: An integrated screening programme was conducted in underserved, remote communities using a Chest X-ray (CRX) machine with AI capabilities to detect lung and heart abnormalities indicative of TB, CRDs, and CVDs. Individuals with X-ray results suggestive of Tuberculosis were subjected to further analysis using GeneXpert and linked to community facilities providing TB services. All those with X-ray abnormalities indicative of CRDs and CVDs were referred to tertiary facilities for confirmatory diagnosis and appropriate linkage to care.

Results: Of the 3006 persons screened for TB and non-TB abnormalities, 1017(34%) had abnormal CXR results (Opacity 47%, Nodule 26%, emphysema 21%), with 16% suggestive of TB (Cavity 2%, fibrosis 15%), while 35% had abnormalities indicative of CRDs and CVDs (emphysema 21%, blunted costophrenic angle 9%, cardiomegaly 15%, vascular calcifications 11%, Pleural effusion 7%, Tracheal shift 5%); with a 99% enrollment rate for TB care while only about 2% of non-TB conditions referred to tertiary facilities linked to care.

Although case detection increased due to integrated screening, access to care remained a significant challenge, as over 98% of individuals referred for CRD and CVD care at tertiary facilities were unable to enroll in treatment due to transportation barriers and the high cost of accessing care.

Conclusions: While integrating screening improves case detection, there is a need to bridge the gaps in decentralized, integrated, and affordable health care to improve health outcomes among underserved communities, affording individuals universal health coverage.

EP20 Messaging that matters: Effective communication for TB elimination

EP20-889-19 Could content creation be the hope of TB diagnosis? Insights from KNCV Nigeria's Wellness on Keke initiative

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Nigeria, with a significant gap between estimated incidence and reported cases. This study explored the potential of content creation to improve TB diagnosis rates within the context of KNCV Nigeria's Wellness on Keke (WoK) initiative, a mobile health program designed to reach underserved populations.
The study aimed to determine if strategically developed content can enhance TB awareness, reduce stigma, and encourage individuals to seek timely diagnosis through the WoK initiative.
Intervention or response: This study utilized an extended literature review approach to explore the potential of content creation, through an investigation of previous successful TB campaigns that have utilized content creation in Nigeria and similar settings.
The analysis focused on identifying effective content formats, potential delivery methods, and the specific opportunities and challenges of delivering content via the WoK platform.
Results/Impact: The analysis indicated substantial potential for utilizing tailored content creation strategies; for example, leveraging storytelling and engaging trusted community figures such as the Keke drivers themselves, were highlighted as particularly promising approaches. Evidence from other successful TB campaigns in Nigeria underscored the effectiveness of employing multi-channel communication strategies, utilizing local languages, and sharing relatable personal narratives.
Finally, the study identified several specific challenges to implementing these content strategies within the mobile WoK framework, such as the existing digital divide, variations in literacy levels among target populations, the crucial need for cultural sensitivity in messaging, and possible logistical challenges inherent in a mobile initiative.
Conclusions: The findings of this study revealed that despite potential challenges, content creation can encourage timely healthcare-seeking behavior for TB and thus improve diagnosis rates.
Thus, integrating targeted, culturally relevant content creation into the WoK initiative and broader strategies offers considerable potential „hope" for enhancing TB diagnosis in Nigeria.

EP20-890-19 360-degree communication campaign to mobilize communities to undergo early testing for Tuberculosis in India

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Background and challenges to implementation: The National Tuberculosis Elimination Programme endeavors a TB-free India by, targeting decline in annual TB incidence rate, decline in death due to TB and Zero catastrophic expenditure due to TB
Though TB incidence and mortality rates have decreased since 2015, challenges such as stigma, diagnostic gaps, and undernutrition require intensified efforts through community-centric approaches. A focused Information, Education and Communication, IEC campaign was necessitated as the National TB Prevalence Survey [1] highlighted that 64% people who showed symptoms did not seek care.
[1] National TB Prevalence Survey in India 2019 – 2021
Intervention or response: A 100-day intensified campaign for TB Elimination in India's high prevalence districts[1]. Focused IEC activities were undertaken to leverage all communication platforms and ensure impactful outreach for increasing awareness, reducing stigma, and encouraging community participation in TB detection drives. Engagement though social media and editorial media helped in increasing salience and motivating vulnerable people to undergo TB Testing.
[1] Shortlisted basis high death rates, testing gaps and high TB incidence) across 33 States/UTs, including high-burden of TB disease and mortality due to TB, tribal, mining, and aspirational districts.
Results/Impact: A 360-degree targeted IEC campaign was released to increase awareness, negate stigma and increase people's participation for TB Elimination. Focused activities included 1,94,185+ awareness activities, 62,981 stigma reduction activities, 59,853 sensitization & stigma reduction activities with students and teachers, 24,322 activities were held with opinion leaders, community influencers, religious organizations, 8,467 Mid-media and local IEC awareness Sessions, Editorial Media coverage that included 5,755+ articles in Print /Electronic Media and Conversations around #TBMuktBharat on twitter yielded 10,904 Mentions by 4,891 Unique Authors.
Conclusions: The 100-day intensified campaign emphasized on people's movement to increase TB awareness among general population and motivate vulnerable individuals and symptomatic cases to undergo TB testing, prevention and treatment.

EP20-891-19 Bridging the TB knowledge gap: The impact of media in Himachal Pradesh, India

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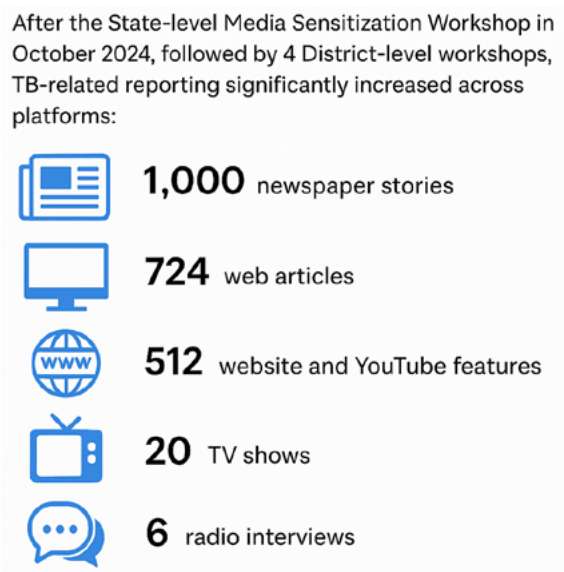
Background and challenges to implementation: TB is a serious public health problem in India requiring a comprehensive strategy engaging different stakeholders including community to achieve elimination. Lack of awareness among general population on TB warrants the use of mass media to drive large-scale behavioural change to improve diagnosis, treatment and prevention.
Intervention or response: A media advocacy & sensitization meeting was organized in the state of Himachal Pradesh in October 2024 which had participation from 43 journalists. To drive sustainability and maintain momentum, four media workshops at district level were organized which were attended by 110 journalists. They were sensitized about reporting on TB, programme updates and encouraged to use their platform to be the eyes and ears of the programme in ensuring TB services reach the last mile stakeholder



Results/Impact: After these 5 workshops TB-related reporting improved significantly, both qualitatively and quantitatively across platforms at State and District levels From October 2024 to March 2025, there were 1,000 newspaper stories, 724 web articles, 512 website and YouTube features, 20 TV shows, 6 radio interviews, and 450 social media/Youtube reports. Organic coverage ranged from 3 to 30 stories per month. This extensive media engagement played a key role in raising awareness about TB symptoms, services, and early treatment—contributing to improved health-seeking behaviour across Himachal Pradesh and strengthening community support for TB elimination efforts.
Conclusions: After the media sensitization workshops in HP, media has emerged as a critical catalyst in the people's movement against TB with a sustained increase in coverage on TB across versatile platforms. It indicates that a comprehensive and transparent sensitization of media journalists on TB helps in having sustainable engagement. Furthermore, these media outputs were free and organic, making them more credible and effective, and underlining the potential of this intervention to be scaled up to national and global levels.

EP20-892-19 Organizing site visits for journalists to provide firsthand, experiential insight into TB program interventions

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Background and challenges to implementation: In line with the National Strategic Plan, India's National TB Program (NTP) has implemented several innovative strategies to improve access to quality, affordable TB care. Showcasing these initiatives is essential – not only to raise public awareness and encourage greater service uptake, but also to reinforce stakeholder commitment and morale. Mainstream media plays a pivotal role in promoting evidence-based discourse around program achievements.
Intervention or response: In March 2025, the NTP organized experiential learning visits for journalists from leading Indian media outlets. These visits, conducted at the close of India's specialized 100-Day Intensified TB Elimination campaign, showcased decentralized service delivery, innovative screening and diagnostic approaches, and community engagement strategies.
The visits were held in Uttar Pradesh – India's most populous state with nearly 26% of the national TB burden and Meghalaya – a remote northeastern state with challenging terrain.
Results/Impact: Journalists from eight major Indian national outlets participated and gained firsthand exposure to different program interventions and community engagement approaches. These included decentralized TB service delivery models through community-level Ayushman Aarogya Mandirs (Primary Healthcare Centres), community screening drives using AI-enabled portable

X-rays, and involvement of TB survivors as champions. Interactions with patients, healthcare workers, and local administrators deepened their understanding of local contexts, leading to more informed and impactful reporting. Following the two visits, over 150 media reports were published highlighting key aspects of India's TB response and serve to generate greater awareness about TB symptoms, available services, and address myths and misconceptions, thus reducing stigma, and encouraging healthcare seeking behaviour.

Conclusions: Experiential visits provide journalists with a unique opportunity to witness on-ground realities, understand sociocultural contexts, and engage with cutting-edge approaches to service delivery. By connecting journalists directly with on-ground realities, such initiatives strengthen public awareness and community engagement – key to sustaining TB elimination efforts.

EP20-893-19 From silence to strength: A 100-day tuberculosis-awareness drive utilizing community radio, newspapers, and television broadcasts under IMPACT-India in Chandigarh Union Territory (UT) and Punjab, India

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in India, with stigma, misinformation, and delayed diagnosis continuing to hinder progress towards TB elimination. Traditional IEC (Information, Education, and Communication) efforts often fall short in reaching grassroots populations.

In this context, community and mass media platforms have emerged as powerful tools to engage the public, drive awareness, and reduce stigma, particularly in underserved regions.

Intervention or response: Under the Integrated Measures for Prevention and Care in TB (IMPACT)-India Project, TB Alert India leveraged mass media to amplify TB awareness across Chandigarh-UT and Punjab. Over six months, more than 200 newspaper articles, 5 Television interviews, and FM Radio Chitkara's 100-day segment "Meri Kahani, Meri Zubaani" (My Story, My Voice), aired from December 9, 2024, to March 24, 2025, reached an estimated 3 million listeners. The segment featured survivor stories and expert insights, driving community engagement. The Governor of Chandigarh-UT honored TB Champions for inspiring change within the community. This strategic media advocacy significantly bolstered awareness, engagement, and solidarity in the fight against TB. The data from Ni-kshay (India's digital TB surveillance system) was extracted and analysed.

Results/Impact: The media-driven advocacy campaign boosted awareness and health-seeking behavior over six months, leading to a 13% increase in TB notifications across Punjab. The five intervention districts - Ludhiana, Jalandhar, Patiala, Moga, and Firozpur recorded a 21.3% rise, while Chandigarh-UT saw a 22% increase. Compared to October–March 2023–2024 and 2024–2025, these gains reflect impactful community engagement in TB prevention and care, reaching millions statewide.

Medium	Reach/Impact
Radio	FM Radio Chitkara reached over 3 million rural listeners through its 100-day broadcast initiative.
Television	Over 10 million viewers watched the TB-related news coverage on various TV channels.
Newspapers	Publications like local news paper Punjab Kesari, Jagbani and The Times of India reached a daily readership of 2 million people.
TB Notifications	-TB notification in Punjab increased by 13%. - Intervention districts in Punjab recorded an exclusive increase of 21.3%. - In Chandigarh-UT, TB notifications rose by 22%.

Table-1: Showing Reach and Impact of Media-Driven Advocacy.

Conclusions: The IMPACT-India Project highlighted the power of media-led, community driven advocacy amplified the reach of TB awareness campaigns. By mainstreaming the voices of TB survivors and experts, and recognizing them publicly normalized the TB conversations destigmatizing TB created a scalable model for public health communication in India.

EP20-894-19 Smartphone and social media use among people living with tuberculosis: A key for less resource intensive IEC

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Background: Though resource intensive, IEC (Information, Education, and Communication) is crucial for effective tuberculosis (TB) program implementation. Digital health technologies can make IEC less resource intensive. Though there is sufficient literature on use of digital health technologies in TB, majority were on TB diagnosis and treatment adherence using mHealth applications, text messaging, calls or videocalls.
Though telecom industry being fast evolving, the scientific literature on smartphone access and use among people with tuberculosis (PWTB) is limited and not assessed periodically. We explored smartphone use among PWTB to identify potential social media platforms for IEC.
Design/Methods: We enrolled 30 adults (≥18 years) with drug-sensitive pulmonary TB at treatment initiation in an ongoing study from public TB clinics in Pune, India. Sociodemographic and smartphone use questionnaires were administered by trained staff at enrolment. Descriptive statistics were used to summarise the data.

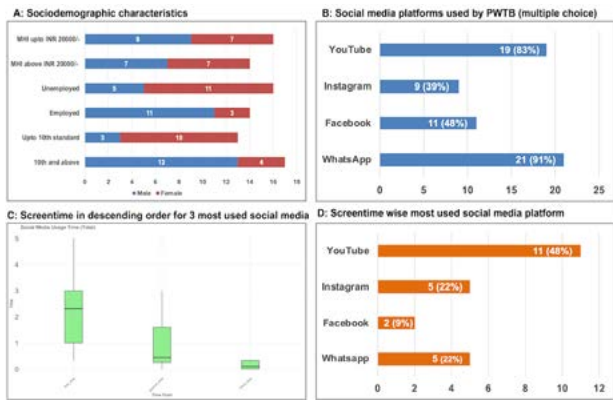

Figure. Sociodemographic characteristics and social media use among people with tuberculosis.

Results: Of 30 PWTB, 14 (47%) were female, 24 (80%) owned a smartphone and all of them had internet access. The primary internet was mobile internet for 22 (92%). The median screentime of social media use among PWTB was 3.1 hours per day (IQR 1.5, 4.7). Among 96% (23/24) who were using social media, 21 (91%) were using WhatsApp, 19 (83%) YouTube, 11 (48%) Facebook and 9 (39%) Instagram. When ranked by screentime, the maximum time spent on a single application (2.3 hours, IQR 1.0, 3.0) by 11 (48%) on YouTube whereas by 5 (22%) each on WhatsApp and Instagram.
Conclusions: Though majority PWTB were using WhatsApp and YouTube, based on screentime YouTube was the most used social media platform. Standalone mHealth applications are important for IEC but a scoping review by Giebel GD et al (2023) comprehensively assessed their challenges and barriers. Hence, IEC additionally needs to be integrated in social media platforms used by PWTB.

EP20-895-19 Tuberculosis education and communication in the digital era: Mixed-methodology study to assess perspectives of healthcare professionals and other stakeholders

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Background: Among the challenges faced in India's efforts to eliminate tuberculosis, is identifying and bridging inadequacies in awareness and perceptions about the disease, its diagnosis, treatment, prevention and other services, in different groups such as the public, healthcare professionals, other healthcare staff and stakeholders. As per the last national tuberculosis prevalence survey (2021), 55% of symptomatic individuals across the country either ignored their symptoms or couldn't recognise them. It is also vital for healthcare providers to stay updated with relevant information. Advocacy, communication and social mobilisation (ACSM) interventions are directed at bridging such gaps.
A key challenge in planning and implementing these is their impact evaluation. A feedback mechanism incorporating the same is likely to significantly help shape ACSM interventions to be more target-specific and resource efficient.
Design/Methods: Quantitative: Survey to assess perceptions regarding tuberculosis IEC and digital media usage for the same, among physicians and other medical professionals actively dealing with tuberculosis in everyday practice. 152 responses were collected, and convenience sampling is being continued to strengthen the study. **Qualitative**: Thematic analysis of challenges and ways ahead in planning and implementing ACSM interventions, explored through FGD and KII.

Results:

Practice area	Rural: 39 (25.6%)	Urban & semi-urban: 113 74.4%)		
Source of knowledge/updates about tuberculosis (mutually inclusive)	Formal medical education: 141 (92.7%)	CMEs, trainings & workshops: 113 (74.3%)		
Preferred modes to receive updates/ information about tuberculosis (mutually inclusive)	Offline such as CME/training/ workshop, etc: 107 (70.3%)	Online training sessions: 87 (57.2%)	Social media platforms (Message apps, Instagram, X, YouTube, Facebook): 85 (55.9%)	
Perception of tuberculosis awareness among general public	Inadequate: 93 (61.2%)	Adequate: 48 (31.6%)	Can't say: 11 (7.2%)	
Perception of tuberculosis awareness among other healthcare professionals	Inadequate: 59 (38.8%)	Adequate: 93 (61.1%)		
Most effective platform for tuberculosis IEC to public as per perception (mutually exclusive)	Social/digital media: 46 (30.2%)	Awareness sessions or display at public sites: 36 (23.6%)	Print or mass media: 28 (18.4%)	Others- Door-to-door campaigns (15), Educational institute/ workplaces: (7), one-on-one interactions with healthcare provider (5), and three more
Average hours spent on social media (self)	Less than 1 hour: 37 (24.3%)	1-2 hours: 67 (44%)	2-6 hours: 45 (29.6%)	More than 6 hours: 3
Average hours spent on social media by average beneficiary/ patient (perception)	Less than 1 hour: 16 (10.5%)	1-2 hours: 52 (34.2%)	2-6 hours: 62 (40.7%)	More than 6 hours: 22 (14.4%)
Maximum time spent on (social media platform, 4 options)	YouTube: 54 (35.5%)	Instagram: 41 (26.9%)	Facebook: 34 (22.3%)	X: 6 None of these: 17
Stakeholder groups to be involved in tuberculosis IEC	Healthcare professionals: 121 (79.6%)	Community health staff & volunteers: 111 (73%)	Media-persons, politicians, community leaders and influencers: 94 (61.8%)	People affected personally: 89 (58.5%) NGOs and civic associations: 87 (57.2%)

Conclusions: Our findings suggest a need to revisit certain strategies employed in tuberculosis IEC for the public as well as healthcare and ancillary professionals. The role of digital media is widely perceived to be evolving and significant, reflecting a need for more investment. Collaboration between IEC on tuberculosis and other public health concerns such as air pollution, antimicrobial stewardship, airborne infection control, lung cancer screening and tobacco control, is deemed useful, as is involvement of more diverse stakeholder groups. Lack of understanding of target audience, poor impact visibility, as well as scope for better financial planning, and identification and motivation of facilitating groups, were among the major challenges identified for effective IEC.

EP20-896-19 Barriers and facilitators of tuberculosis treatment among Cameroon refugees in Nigeria: A mixed-methods study

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Background: Refugees globally face a disproportionately high burden of tuberculosis (TB) and significant barriers to healthcare. Nigeria currently hosts large numbers of refugees displaced by the unrest in Southern Cameroon. To support improved TB care, Janna Health Foundation and Sufabel Community Development Initiative conducted research to identify care access barriers as perceived by refugees with TB receiving treatment in public facilities in Taraba State. This paper seeks to showcase findings on care access barriers to TB services experienced by Refugees in Taraba State.
Design/Methods: A 15-item Likert-scale questionnaire was developed based on eight semi-structured interviews with religious and community leaders, eight focus group discussions with healthcare providers and people affected by TB, and 25 individual interviews with people with TB. Trained refugee peers administered the questionnaire to 130 participants (66 women, 64 men) across three local government areas (LGAs) while they waited for treatment in public facilities.
Results: The most commonly reported individual barriers were hunger (93.0%), lack of money for transport (92.3%), and inability to pay service costs (90.8%). Health system barriers included fear of disease transmission (70.0%), stigma from healthcare workers (60.0%), lack of potable water (55.0%), and medication stockouts (51.0%). Interpersonal barriers included community stigma (70.0%), lack of clothing deemed appropriate (55.8%), and language challenges (54.6%).
Overall, 60.8% (n=79) identified at least 10 of the listed items as barriers to care.
Conclusions: Findings underscore the compounded barriers faced by Cameroonian refugees navigating TB care—where poverty, displacement-related vulnerability, and systemic health service gaps intersect. Addressing these challenges requires integrated approaches that link TB care with food security, financial protection, and stigma reduction, both within facilities and communities. Strengthening health systems to be inclusive of displaced populations, and enabling affected communities to shape responses, is essential to building equitable and resilient TB care in displacement settings.

EP20-897-19 Effect of community awareness, screening, diagnosis, and treatment campaigns on TB care in Uganda

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Background: SETTING: Eight districts in central Uganda with 105 health facilities.
OBJECTIVE: To evaluate the effectiveness of the community awareness, screening, testing, diagnosis, and treatment (CAST-TB) campaigns on the number of people screened for, presumed to have, and diagnosed with TB disease.
Design/Methods: We designed a quasi-experimental study and utilized Bayesian Structural Time-Series analysis for counterfactual predictions over 24 months (12 months before vs 12 months during intervention). The intervention was the CAST-TB campaigns. The outcomes included the number of people screened for, presumed to have, and diagnosed with TB disease.
Results: The intervention led to a 36% (95% credible interval [CrI] 8.4–65, P = 0.005) increase in the number of people screened for TB disease (1,194,257 observed vs 875,211 predicted), a 29% (95% CrI 5.3–52, P = 0.01) increase in the number of people presumed to have TB disease (25,784 observed vs 19,997 predicted), and a 49% (95% CrI 25–75) increase in the number of people diagnosed with TB disease (2,566 observed vs 1,719 counterfactual).

Outcome	Number screened for TB disease	Number presumed to have TB disease	Number diagnosed with TB disease
Intervention period	1,194,257	25,784	2,566
Counterfactual (95% CI)	875,211 (629,329–1,115,424)	19,997 (15,374–24,726)	1,719 (1,281–2,137)
Percentage increase, % (95% CI)	36 (8.4–65)	29 (5.3–52)	49 (25–75)
P-value	0.005	0.01	<0.0001

Table 2. Effect of CAST-TB campaigns on the study outcomes.

Conclusions: We found the CAST-TB campaigns improved the number of people screened for, presumed to have, and diagnosed with TB disease. Our evidence provides the data needed to support the Uganda MoH's effort to scale up the CAST-TB campaigns across the country.

EP20-898-19 Enhancing TB treatment: Developing and evaluating Spanish-language LLM chatbots for real-time support, accuracy, and empathy

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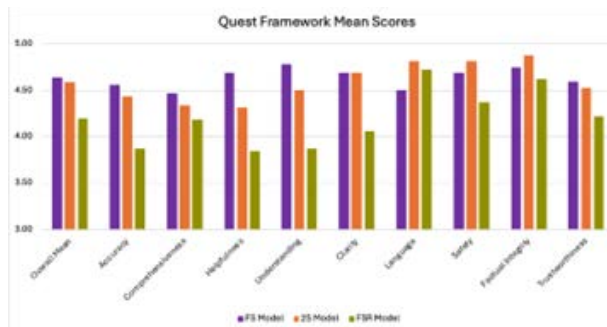
Background: TB treatment adherence is challenged by healthcare access barriers, provider shortages, and prolonged treatment with side effects. Digital adherence technologies (DATs) offer real-time monitoring but often lack 24/7 support, integrated mental health care, and tailored solutions for Spanish-speaking populations. Our team developed TB Treatment Support Tools (TB-TSTs), a DAT integrating a mobile app, linkage to treatment supporters, and an objective adherence test. To enhance scalability, we developed and validated a Spanish-language, large language model (LLM)-powered chatbot for real-time TB treatment support.
Design/Methods: Using a convergent mixed methods approach, we developed six chatbot models with various training techniques, including zero-shot learning, few-shot learning (FS), and retrieval-augmented generation (RAG). A two-step classification process identified queries requiring empathy. Internal evaluations refined chatbot responses, while external evaluations by ten Spanish-speaking TB experts assessed chatbot accuracy, comprehensiveness, and linguistic appropriateness (QUEST framework, 1-5 scale). Empathy was rated separately (0-2 scale). Thematic analysis identified areas for improvement.
Results: The FS chatbot performed best (4.64/5), followed by 2S (4.59/5) and FSR (4.20/5) (Figure 1).



Empathy scores ranked FS highest (1.77/2), outperforming 2S (1.54/2) and FSR (0.97/2). Challenges included overly technical language, difficulty distinguishing latent

from active TB, and occasional vague responses. FS and 2S models conveyed warmth and engagement, though FS sometimes lacked empathy, and 2S did not always tailor responses.

Conclusions: LLM-powered chatbots show promise for TB support, with all top models scoring ≥4 across evaluation dimensions. FS outperformed others, while RAG introduced inconsistencies. Future work will refine chatbot responses, integrate mental health interventions, and incorporate personalized patient profiles to improve knowledge retention. Iterative evaluations with TB experts and survivors will optimize accuracy and empathy, establishing a scalable, culturally adaptable AI-driven TB support tool for future clinical trials and external funding.

EP21 TB contact screening across the age spectrum

EP21-899-19 Active tuberculosis in household contacts of central Ethiopia: Whole genome sequencing based genomic diversity, transmission dynamics and drug resistance pattern analysis

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Background: Mycobacterium tuberculosis complex genotyping improved the understanding of transmission dynamics and is used to support or refute transmission assumptions between epidemiologically linked cases.
This study aimed to analyse genomic diversity, transmission dynamics and drug resistance mutation in epidemiologically linked pulmonary TB patients and their household contacts in central Ethiopia.

Design/Methods: The study was conducted from January 2023 to December 2023 at randomly selected public health facilities in the central part of Ethiopia. A total of 50 genomes from Pulmonary TB patients and their Household contacts were considered for WGS analysis using the MTBSeq pipeline and Ridom SeqSphere software for drug resistance and genotypic analysis(SNP distance cut-off of 12).

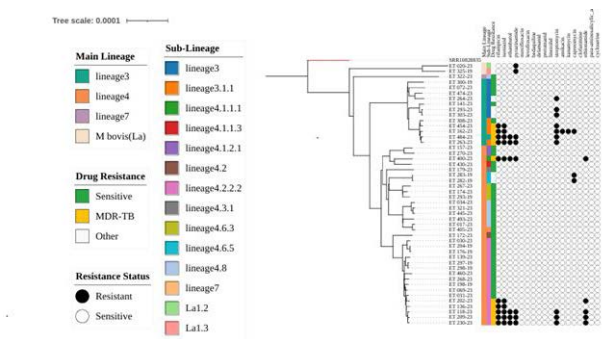

Figure 1. Phylogenetic tree constructed by pairwise distance (maximum likelihood) of 47 *Mycobacterium tuberculosis* isolates including SRR10828835 as reference genome.

Results: Through the analysis of successful WGS data from 48 isolates, we discovered that most of the isolates were part of lineages L4 (Euro-American, 33/48; 68.75%)

and L3 (Delhi-CAS, 12/48; 25.0%), with the Euro-American (L.4.2.2) being the most prevalent sub-lineage (16/48; 33.33%). Tuberculosis caused by *M. bovis* represented 4.17% (2/48). Among the 48 isolates, approximately one-fifth were found to be at least MDR-TB (10/48; 20.83%). The transmission analysis revealed 4 related events, resulting in an overall clustering rate of 17.02% (8 out of 47). Almost 75% (3 out of 4) of the clustered strains came from the same household, while 25% were from non-index household contacts. Three of the 10 index-HHC pairs with valid WGS analysis share the exactly matched genome. We have also identified previously unreported mutations linked to resistance Amikacin and Ethioniamid.
Conclusions: Individuals residing in areas with a high burden of tuberculosis are at risk of contracting the disease from sources beyond their homes. Genomic sequencing gives insights into the epidemiological patterns of TB, leading to better strategies for target groups at high risk of unnoted TB transmission.

EP21-900-19 Application of RNA sequencing in school tuberculosis outbreak response: A nested case-control study in Shanghai, China

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Background and challenges to implementation: Students are a key population for tuberculosis (TB) prevention and control in China. As active TB cases in schools can rapidly trigger outbreaks. To curb transmission, timely screening of student contacts—including detecting active cases and identifying latent tuberculosis infections (LTBI)—is critical. Globally, no reliable method can predict the risk of progression from LTBI to active TB. This study aimed to evaluate the role of RNA sequencing (RNA-seq) in case prediction and targeted intervention.
Intervention or response: During a school TB outbreak in Shanghai, baseline venous blood samples were collected from all 10 students with LTBI. All close contacts of the index case were followed for one year. After active TB cases emerged during follow-up, baseline blood samples from cases and matched controls (1:4 ratio by sex, age, and exposure level) underwent RNA-seq. Differentially expressed genes were enriched and analyzed via Kyoto Encyclopedia of Genes and Genomes (KEGG).
Results/Impact: A 19-year-old female student's failure to seek timely medical care led to the outbreak. Among 36 close contacts, 10 (27.8%) tested positive for TB infection, and two (20.0%) progressed to active TB. RNA-seq combined with cluster analysis identified the two secondary cases three months earlier than traditional methods. KEGG enrichment analysis revealed that differentially expressed genes in the two secondary cases, compared to LTBI controls, were predominantly enriched in pathways related to bactericidal functions and immune regulation.

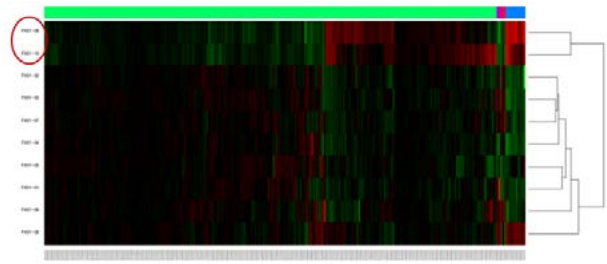

Figure 1 The tree diagram of cluster analysis for 10 students with latent tuberculosis infection.

Conclusions: RNA-seq demonstrates potential for identifying high-risk individuals who progress to tuberculosis during TB outbreaks, thereby enabling early intervention to disrupt transmission. This technology could serve as a strategic tool for targeted TB prevention and control in school settings.

EP21-901-19 Reasons for non-enrollment of household contacts in a multinational MDR-TB preventive treatment clinical trial

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Background: Household contacts (HHCs) of people with Multi-Drug Resistant Tuberculosis (MDR-TB) are at high risk of developing tuberculosis disease. We describe the reasons HHCs did not enroll into ACTG A5300B/IMPAACT 2003B/PHOENIx (NCT03568383), an ongoing cluster-randomized trial evaluating efficacy and safety of Delamanid versus Isoniazid for tuberculosis preventive treatment (TPT).

Design/Methods: All HHCs of enrolled MDR-TB index participants were enumerated and approached for the study. Reasons for non-enrollment were collected. High-risk groups were children <5 years old, HHCs ≥5 years who were living with HIV, and HHCs ≥5 years who had a positive test of tuberculosis infection. Difference in participation by risk group was analysed using Chi-Square Test.

Results: We enumerated 8378 HHCs of 1927 MDR-TB index participants from 13 countries from July 2019–January 2025. 1715 (20%) declined screening and 2374 (28%) screened out (ineligible). Screened HHCs who did not enroll had a median age of 26 years; 57% were females, 6% were <5 years old, 5% were living with HIV (PLWH), and 38% had a positive test for TB infection. Of 2374 screened and deemed ineligible, 1317 (55%) were not in a defined high-risk group, 180 (8%) had active tuberculosis disease, and 105 (4%) had laboratory abnormalities. Of 4272 confirmed eligible for the trial, 298 (7%) opted not to enroll. Reasons for non-enrollment varied by country and by high-risk group (see Table). PLWH were more likely to screen out (p<0.0001). Children <5 years old were less likely to enroll despite being eligible (p<0.0001).

Table: Reasons for non-enrollment of HHCs in the PHOENIx MDR-TB preventive treatment trial

		Range of Prevalence by Country		High-Risk Group*		
	Prevalence	Lowest	Highest	Age<5 years	Living with HIV	LTBI
Number of HHCs Enumerated	**8378**					
Declined screening (% of enumerated)	20%	Zimbabwe (0%)	Vietnam (84%)			
Number of HHCs Screened	**6663**			**542**	**460**	**4077**
Failed screening (% of screened)	36%	Peru, Uganda (32%)	Vietnam (55%)	18%	27%	15%
Number of HHCs Eligible	**4272**			**446**	**338**	**3468**
Not enrolled due to accrual pause (% of eligible)	1%	Botswana, India, Kenya, Vietnam, Zimbabwe (0%)	Brazil, South Africa, Tanzania (2%)	1%	2%	1%
Opted not to enroll (% of eligible)	7%	Tanzania (1%)	India (22%)	11%	3%	6%

Abbreviations: HHC, household contact; LTBI, latent TB infection

*High risk group, defined hierarchically from left to right, were eligible for study participation; remaining HHCs were not eligible for the study. Risk group was unknown for those who did not screen.

Conclusions: Characterizing reasons for non-enrollment provide understanding of the trial population and the eventual generalizability of results. Knowing reasons for screen failures and subsequent non-enrollment among those screened for this trial of household contacts is important to minimize gaps in future implementation of TB contact management.

EP21-902-19 Perceptions of universal TB testing among persons with TB and household contacts in Lesotho, South Africa and Tanzania

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Background: Universal TB testing (UTT) is a strategy that includes TB testing of all contacts of persons with TB (PWTB) regardless of symptoms. It is critical to explore perceptions and acceptability of any intervention prior to full scale implementation for maximum success and improve patient outcomes. We describe perceptions of UTT among PWTB and their household contacts (HHCs) in three high-burden TB countries.

Design/Methods: We conducted in-depth interviews (IDIs) with PWTB and HHCs who were randomly selected from those enrolled in the CUT-TB trial conducted in Lesotho, South Africa, and Tanzania. IDIs were conducted between November 2023-December 2024. Interviews were audio-recorded, transcribed verbatim, translated, and thematically analysed using Quirkos software.

The interview guide explored four key themes: outcomes of TB testing, drivers and facilitators of stigma, stigma marking, and the health and social impact of TB at individual, interpersonal, and community levels. A deductive coding approach, guided by the Consolidated Framework for Implementation Research (CFIR), was used to analyse perceptions of UTT.

Results: We interviewed 135 participants: 75 PWTB and 60 HHCs. The mean age of participants was 43.9 and 52% were male. Participants highlighted the importance of TB testing even in the absence of symptoms, supporting UTT approach, although perceptions varied across groups. PWTB supported testing of HHCs but feared being identified as the source for community contact tracing due to fear of stigma and judgment. HHCs acknowledged the value of TB testing and indicated that perceived personal risk of TB influenced their willingness to be tested.

Participants preferred home-based testing over facility visits due to factors such as transport costs, time constraints, stigma, proximity to health facilities, and limited resource.

Conclusions: UTT was generally acceptable to participants and when combined with efforts to incorporate contacts' testing preferences and stigma reduction interventions in communities, may offer a useful approach to improve TB outcomes.

EP21-903-19 Resilient TB contact tracing amid crisis: Evaluating household-based screening during the COVID-19 pandemic

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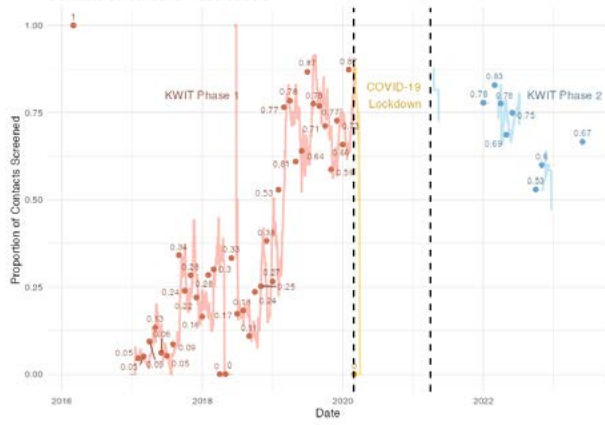
Background: Effective tuberculosis (TB) elimination depends on identifying and treating high-risk groups, such as household contacts. Contact tracing is essential for TB elimination but is vulnerable to disruptions, including those caused by the COVID-19 pandemic.
This study assessed the pandemic's impact on TB contact tracing and evaluated whether household-based strategies can sustain screening efforts during crises.
Design/Methods: We analyzed two phases of a TB program in the King Sabata Dalindyebo sub-district, Eastern Cape, South Africa. Phase one (March 2016–March 2020) primarily used passive, facility-based screening. Phase two (April 2021–June 2023) relied on active, household-based screening supported by mobile chest x-ray units. We reviewed records of household contacts and compared the proportions screened.
An interrupted time-series analysis assessed screening trends for before, during, and after COVID-19 disruptions, adjusting for seasonality, facility type, and household clustering.

Figure 1. Monthly Proportion & 30-Day Rolling Average of Proportion of Household Contacts Screened for Tuberculosis



Results: In phase one, 38.5% (2945/7652) of contacts were screened; in phase two, 71.1% (1588/1139, OR=3.9) were screened. Screening peaked at 87% in February 2020 but dropped to 0% in March 2020 with COVID-19 onset. Screening resumed at 81% in April 2021 but declined to 67% by June 2023.
Screening odds increased monthly overall (OR=1.09, p<0.01), but declined during phase two (OR=-1.19, p=0.04), indicating reduced sustainability over time.
Conclusions: The COVID-19 pandemic severely disrupted TB contact tracing. However, household-based screening rapidly restored high screening levels, demonstrating resilience during public health emergencies. The subsequent decline highlights the need for sustained investment and support to maintain program effectiveness. To ensure continuity of TB services during future disruptions, policymakers should institutionalize flexible household-based screening models within national TB elimination strategies.

EP21-904-19 Scoring the silent threat: Age-specific risk models for pediatric TB contacts

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Background: Children exposed to tuberculosis (TB) at home are at increased risk of developing TB disease. Diagnosing TB in children is challenging due to nonspecific symptoms, paucibacillary disease, and a lack of sensitive diagnostic tools. Because current strategies are limited, we derived risk scores to predict TB disease in child household contacts of pediatric TB patients.
Design/Methods: We analyzed data from a large active screening program in Kotri, Pakistan, including child household contacts of adult and pediatric TB patients. The dataset included demographic information, clinical symptoms, and medical history, and was stratified by age: 0-4, 5-9, and 10-14 years. Univariable and multivariable logistic regression identified significant TB predictors for each group.
Risk scores were calculated using regression coefficients and standard errors. Receiver Operating Characteristic curve analysis determined optimal diagnostic thresholds; discriminatory properties were calculated, maintaining sensitivity at 85%.
Results: Of 3,014 child household contacts, 390 (12.9%) were diagnosed with TB: 203 (52.1%) aged 0-4, 138 (35.4%) aged 5-9, and 49 (12.6%) aged 10-14. Predictors retained in the multivariable models included cough, weight loss, weight percentile, and appetite; fever and BCG scar presence were also included in the 5-9 and 10-14 year models. Discriminatory properties for each model were as follows:
0-4 years: 85% sensitivity, 71% specificity, 39.7% PPV, 95.6% NPV

5-9 years: 85% sensitivity, 77% specificity, 32.1% PPV, 97.6% NPV
10-14 years: 85% sensitivity, 77% specificity, 21.2% PPV, 98.1% NPV

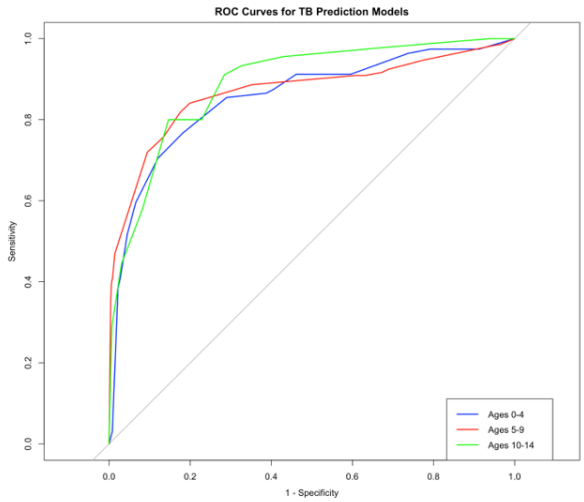

Figure 1. Receiver Operating Characteristic (ROC) Curves for TB Prediction Models in Child Household Contacts

Conclusions: These age-specific risk scores demonstrated high discriminatory performance and should be operationalized into clinical tools to improve screening of child contacts. Further external validation is underway to support wider implementation in Pakistan and similar settings.

EP21-905-19 Chest X-ray operational barriers in school-based pulmonary tuberculosis screening in China: A cross-sectional study

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Background: In China, school-based pulmonary tuberculosis (PTB) control programs mandate PTB screening for high school students. While chest X-ray (CXR) serves as a primary screening modality, operational challenges persist in community-level medical and healthcare institutions, particularly regarding the absence of standardized external quality control mechanisms for CXR interpretation. Preliminary evidence suggested potential underdetection of PTB cases in school settings due to inconsistent CXR reading quality, which may contribute to ongoing TB transmission. This study addresses critical PTB detection gap in implementing large-scale school CXR screening programs.
Design/Methods: This was a cross-sectional study which was conducted among high school students between January 2022 and December 2022 in Chongqing, China. Participating radiologists and doctors underwent standardized training in CXR interpretation protocols. Symptom-based screening and immunological tests were prioritized, with abnormal results triggering CXR examinations. A comparative analysis was conducted between CXR results from the team that has undergone standardized training and those from community-level medical and healthcare institutions in 2021.
Results: PTB screening was conducted among 24,577 Senior 1 and Senior 2 students in Chongqing using CXR between January 2022 and December 2022 in Chongqing, China. The PTB detection rate reached 57 per 100,000 population through systematic CXR screening, significantly exceeding the 2021 baseline rate of 34.8 per 100,000 recorded by community-level medical and healthcare institutions (P<0.001). This discrepancy highlights potential case underreporting in routine surveillance systems.
Conclusions: Our findings substantiate CXR's critical role in school-based PTB control while revealing operational vulnerabilities:
1. Interobserver variability in CXR interpretation may create PTB detection gap;
2. Absence of regular EQC undermines screening reliability.
We propose institutionalizing radiologist competency certification for PTB screening in school students and establishing regional CXR audit panels to standardize diagnostic criteria.

EP21-906-19 Evaluating the impact of clinical contact tracing on tuberculosis case finding and preventive treatment in Lagos State, Nigeria: A pilot study

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Background and challenges to implementation: Nigeria with a population of over 220 million has one of the highest burdens of TB in the world and 6th highest contributor to the global TB incidence. The Nigerian National TB management and Control Guideline recommends all household and close contacts of bacteriologically diagnosed TB patients be evaluated for TB. However, contact

tracing of bacteriologically positive cases has not produced the expected yield as part of the broader efforts to meet the 2030 TB target to eliminate TB epidemic as outlined in UN SDGs. We piloted the contact tracing of clinical TB Case to see its impact on TB cases finding and preventive treatment.

Intervention or response: The TB LON 3 project implemented by Institute of Human Virology Nigeria (IHVN) with the support from USAID piloted Contact Tracing of clinically diagnosed TB case in public facilities from June to August 2024 in Lagos State Southwestern Nigeria.

Results/Impact: During the study period, a total of 973 index TB cases were contact traced, of which 249 (26%) were clinically diagnosed patients, 3,493 contacts were identified among the index cases, out of which 955 (26%) were contacts of the clinically diagnosed index cases and were all screened for TB, 196 presumptive cases were identified and evaluated, 21 TB cases were reported and started on treatment, contributing 24% of the total TB cases. With an NNT and NNS of 45 and 9 respectively showing high efficiency. In terms of TPT, 203 (8%) were contact of clinically diagnosed index cases.

Table 1: Bacteriological and clinical cascade from contact investigation, June to August 2024.

	June		July		August		Total		
	Bacteriological	Clinical	Bacteriological	Clinical	Bacteriological	Clinical	Bacteriological	Clinical	% Contribution
Number of Index TB cases contact traced	336	100	330	82	307	67	973	249	26%
Number of contacts identified	1114	340	1144	298	1235	310	3493	948	27%
Screened	1098	340	1144	300	1233	315	3475	955	27%
Presumptives	237	101	277	54	232	41	746	196	26%
Presumptive evaluated	237	101	277	54	232	41	746	196	26%
Cases diagnosed	20	11	36	4	32	6	88	21	24%
Treatment/notified	19	11	36	4	30	6	85	21	25%
Total enrolled on TPT	680	155	809	6	981	42	2470	203	8%
Number Needed to Screen	55	31	32	75	39	53	39	45	
Number Needed to Test	12	9	8	14	7	7	8	9	

Conclusions: The findings from this study highlight the potential of clinical contact tracing bridging gaps in TB case finding and preventive treatment, particularly in high-burden areas like Lagos State. Scaling this approach can accelerate progress toward achieving the 2030 TB elimination targets, reducing TB morbidity and mortality in Nigeria.

EP21-907-19 Strain discordance among household index-secondary patient pairs with tuberculosis disease

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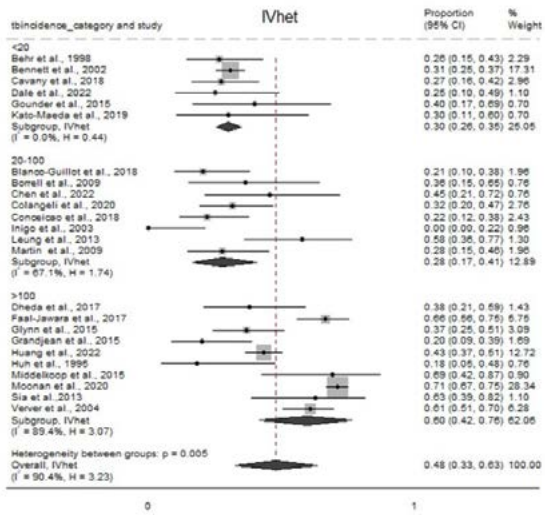
Background: We describe the prevalence of *Mycobacterium tuberculosis* complex strain discordance among household index-secondary patient pairs with active tuberculosis and estimate the proportion of all tuberculosis in each community attributable to recent household transmission.

Design/Methods: We conducted a systematic review and meta-analysis whereby MEDLINE, EMBASE, Global Health, Web of Science and POPLINE databases were searched with updated searches on 26 January 2024. We included molecular epidemiology studies describing ≥10 pairs of individuals with a history of household contact; where both individuals had active tuberculosis that was strain typed using mycobacterial interspersed repetitive units–variable number of tandem repeats (MIRU-VNTR), restriction fragment length polymorphisms (RFLP)

or whole genome sequencing (WGS). Studies using low resolution strain typing techniques – 12 or 15 loci MIRU-VNTR – or undertaken during tuberculosis outbreaks were considered high-risk for bias. Pooled estimates of strain discordance were estimated using an inverse variance heterogeneity model. The proportion of all tuberculosis attributable to recent household transmission was estimated as the product of strain concordance and the proportion of all cases in the community with history of household exposure to a putative index case.

Results: Of the 28 studies reviewed, four (14%) were excluded due to high risk of bias. The remaining 24 studies included 1,493 pairs, 718 with discordant strain types. Prevalence of strain discordance was 0.48 (95%CI, 0.33-0.63; I^2 = 90%). Prevalence was greater in high (0.60, 95%CI 0.42-0.76) than low or moderate tuberculosis incidence settings (0.30, 95%CI 0.26-0.35; 0.28, 95%CI 0.17-0.41). Less than 10% of all tuberculosis disease was attributable to recent household transmission.



Forest plot using the IVhet model showing the proportion of household index-secondary patient pairs with discordant *Mycobacterium tuberculosis* complex strain type stratified by TB incidence (per 100,000 population per year)

Conclusions: Household transmission contributes minimally to the overall TB burden. Clustering of tuberculosis patients within households likely reflects both household transmission and shared risk factors for TB disease. Interventions to interrupt community transmission and for improved social protection in vulnerable households and communities should be prioritised.

EP22 The challenge of extrapulmonary TB

EP22-908-19 Clinical profile and outcomes of children with tuberculous meningitis at Kenyatta National Hospital: A six-year retrospective study

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Background: Tuberculous meningitis (TBM) is a devastating form of extra pulmonary tuberculosis, with significant morbidity and mortality in children, especially in high-burden countries like Kenya.

This study aimed to evaluate the clinical profile and outcomes of children with TBM at Kenyatta National Hospital (KNH), Kenya's largest referral hospital.

Design/Methods: We conducted a retrospective cohort study of children aged 0-15 years diagnosed and treated for TBM at KNH between January 2018 and December 2023. Using a consensus case definition, patients were classified as having definite, probable, or possible TBM. Data on socio-demographic characteristics, clinical presentation, diagnostic evaluation, treatment, and outcomes were extracted from medical records and analyzed.

Results: Of 100 eligible children, none had definite TBM, 29% (29) and 71%(71) had probable and possible TBM, respectively. The median age was 2.2 years , with 72% (72) being <5 years. Males predominated at 68% (68), and 67% (67) had a history of contact with someone with TB. Most children, 81% (81), presented with advanced disease (stage II or III). Symptoms included cough 53 (53%), fever 85% (85), lethargy 51% (51) and seizures 77% (77). Among 65 children who had CSF analysis, 96.9% (63) had elevated proteins, mean protein 988.4. ESR was elevated in 83.3 % (30/36).

Neuroimaging was done in 89% (89) of patients, 91% (81) abnormal findings, hydrocephalus 53.9% (48) and 34.8 % (31) basal meningeal enhancement. 93% (93) started on anti-tuberculosis medications and corticosteroids 83% (83). Outcomes were poor with 33% (33) mortality. Among survivors, 55% (55) developed neurological sequelae.

Conclusions: TBM affects mostly children <5 years with high rates of late diagnosis. The mortality rate (33%) is higher than reported studies from other regions.

Our findings show the urgent need for earlier diagnosis and improved management protocols for pediatric TBM in resource-limited settings to reduce devastating consequences of this disease.

EP22-909-19 Long-term survival and prognostic determinants of tuberculous meningitis in a high-migration metropolis: A decade-long bidirectional cohort study

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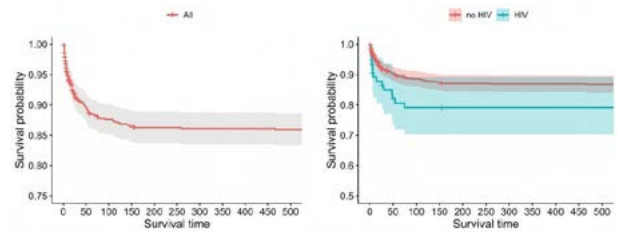
Background: Tuberculous meningitis (TBM) has high global mortality (55-75%), but region-specific outcomes in urban settings with advanced medical systems are poorly characterized.
This study analyzes TBM in Shenzhen, China, a megacity with significant migrant populations and tiered healthcare infrastructure.
Design/Methods: This bidirectional cohort study analyzed clinical data from 715 hospitalized TBM patients admitted to Shenzhen Third People's Hospital between May 10, 2012 and October 10, 2022. Data collected during hospitalization, including surgical procedures and clinical outcomes, were evaluated.
A follow-up telephone survey was conducted in November 2023 to assess survival patterns using Kaplan-Meier analysis, stratified by HIV status.
Results: The study revealed distinct mortality patterns, with in-hospital mortality reaching 7.5% (54/715), significantly lower than global estimates (P<0.001). HIV co-infection emerged as a critical risk amplifier with a 3.4-fold increase in mortality (18.7% vs 6.3%, P=0.002). Temporal analysis identified a critical 30-day intervention window, with 77.8% of deaths occurring within this period (median survival: 24 days, IQR 14-29).
Therapeutic outcomes demonstrated a significant survival benefit from neurosurgical intervention, with external ventricular drainage (96.9% survival, n=32), ventriculoperitoneal shunting (92.9%, n=14), and Ommaya reservoir placement (100%, n=5) demonstrating superior post-discharge outcomes.
Comparative analysis revealed significantly lower mortality in the surgical versus non-surgical cohorts (5.6% vs. 8.9%; HR=0.28, P=0.04).
Longitudinal survival curves showed plateau characteristics beyond 100 days post-admission, with 2-year survival rates diverging significantly between HIV-negative (92.1%) and HIV-positive (76.3%) subgroups (log-rank P<0.001).
Multivariate Cox regression identified three independent predictors of mortality: treatment delay >7 days (HR=2.1), baseline Glasgow Coma Scale ≤12 (HR=3.8), and HIV co-infection (HR=2.6).



Conclusions: This study challenges the notion of uniformly poor TBM prognosis, showing that mortality can be reduced to <10% with early intensive care and staged surgery. By quantifying time-dependent risks and validating HIV-integrated protocols, it offers strategies for TBM management in migration-dense megacities, aligning with WHO urban TB control priorities.

EP22-910-19 GeneXpert (Xpert MTB/RIF) testing of extrapulmonary samples in Nepal: A five-year trends analysis from the National Tuberculosis Program

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Background and challenges to implementation: Extrapulmonary tuberculosis (EPTB) diagnosis is challenging due to the paucibacillary nature of samples and difficulty in specimen collection. Molecular diagnostic tools like GeneXpert (Xpert MTB/RIF) have improved the rapid and accurate diagnosis of both pulmonary and extrapulmonary TB.
This study analyzes the trends and diagnostic yield of extrapulmonary sample testing using GeneXpert in Nepal over the past five fiscal years.
Intervention or response: GeneXpert test data from FY 2019/20 to 2023/24 were extracted from the Nepal National Tuberculosis Program Management Information System (NTPMIS) and analyzed.
Key indicators included valid tests, EP samples tested, TB positivity in EP samples, the proportion of EP samples tested, and the proportion of drug-resistant TB (DRTB) among diagnosed EP cases.
Results/Impact: Between FY 2019/20 and FY 2023/24, the number of GeneXpert testing sites in Nepal increased from 72 to 117, with total tests rising by over 200%. EP sample testing increased substantially, from 474 tests in FY 2019/20 to 9,524 in FY 2023/24. The proportion of

EP samples tested with GeneXpert increased from 1% to 6.8%, reflecting a gradual rise in EP case detection. The positivity rate for EP samples remained comparable to sputum samples, ranging from 10% to 15% over the past three years. TB notifications from EP samples increased from 184 to 1,063.
Despite this rise in case detection, the prevalence of DRTB among EP cases declined from 8.7% in FY 2019/20 to 2.6% in FY 2023/24, indicating improved diagnostic coverage and earlier detection.
Conclusions: Significant increase in GeneXpert testing over the past five years has led to higher EP case notifications and a decline in drug-resistant TB prevalence among EP cases. These findings highlight the critical role of molecular diagnostics in improving TB control, especially for EPTB, and emphasize the need for continued investment in diagnostic infrastructure to sustain progress toward TB elimination.

EP22-911-19 Extrapulmonary tuberculosis in the Netherlands (1993-2022): Localization patterns and treatment outcomes

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Background: Extrapulmonary tuberculosis (EPTB) accounts for a substantial proportion of TB patients in low-incidence countries, but comprehensive data on disease localization and associated determinants and treatment outcomes remain limited.
Design/Methods: The objectives are to explore anatomical localization patterns and treatment outcomes of EPTB in The Netherlands from 1993 to 2022, focusing on socio-demographic disparities. We analyzed national TB surveillance data from 1993-2022. Individuals diagnosed with EPTB were categorized by main localization and stratified by age, sex, country of birth, comorbidities, and treatment outcomes. Determinants of localization were examined using logistic regression.
Results: We included 17,666 EPTB patients, representing 51.9% of all TB patients. 58.7% were female and 71.5% were born outside the Netherlands. The most frequent countries of birth, were the Netherlands (28.5%), Somalia (15.9%) and Morocco (9.4%).
Pleural (28.6%) and peripheral lymph node TB (27.8%) were the most common localizations. Women had higher odds of lymph node (OR:2.02, 95%CI:1.88-2.17), intestinal (OR:1.35, 95%CI:1.17-1.54), urogenital (OR:1.20, 95%CI:1.00-1.43) and bone TB (OR:1.19, 95%CI:1.06-1.34).
Treatment success varied: primary and lymph node TB had high completion rates (>89.0%), while miliary (62.6%) and meningeal/central nervous system TB (72.8%) had the poorest mortality rates of 17.0% and 12.7%, respectively. Pleural TB had a high hospitalization rate (37.3%). Outcomes also differed by country of birth. Patients from Eritrea, Pakistan, Afghanistan and Ethiopia had higher cure rates (>88%) and lower mortality (<1%). Dutch-born patients accounted for the most EPTB deaths (3.1%), while Polish-born patients had the poorest outcome (62.5% cure, 8.9% mortality). Children under 14 had a high cure rate 93.8%, while those aged ≥65 had the highest mortality (6.5%).
Conclusions: EPTB treatment outcomes in the Netherlands vary by localization, age, sex and country of birth. Certain subgroups, such as Polish-born patients, had consistently poorer outcomes. These findings support the need for more tailored care strategies.

EP22-912-19 Beyond the lungs: Extrapulmonary tuberculosis as a risk for TB deaths in faith based health facilities in Kampala, Uganda (2020–2023)

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Background: Extrapulmonary TB (EPTB) poses unique diagnostic and management challenges potentially heightened by delayed and misdiagnosis. This study explored the TB mortality burden in high-volume faith-based hospitals in Kampala city, where annual TB mortality (6.0–8.7%) exceeds the national average (<5%).
Design/Methods: We conducted a retrospective cohort analysis of 3,967 TB patients registered during the period 2020 to 2023 in the electronic Case-Based Surveillance System (eCBSS) across six faith-based hospitals. Mortality rates (per 100 person-months) and survival probabilities (Kaplan-Meier) were stratified by TB-patient classification—pulmonary bacteriologically confirmed (PBC), pulmonary clinically diagnosed (PCD), and EPTB—with Cox proportional hazards models adjusting for age, sex, HIV status, time of outcome, and year of diagnosis.
Results: Overall, 286/3,967 (7.2%) died. Of the 3,967 patients registered, 7.6% (n=302) had EPTB. Out of the 286 total deaths, 39 (13.6%) had EPTB. Of all patient cat-

egories registered, EPTB exhibited the highest mortality rate (3.04 per 100 person-months, 95% CI: 2.21–4.15) compared to PCD (2.05, 95% CI: 1.70–2.46) and PBC (1.24, 95% CI: 1.04–1.47). Survival at 24 months was 0.82 for EPTB, 0.40 for PCD, and >0.90 for PBC (log-rank p<0.0001).
The adjusted hazard ratio (HR) for EPTB mortality was 2.60 (95% CI: 1.80–3.73, p<0.0001) versus PBC, with HIV co-infection (HR: 3.13 for newly tested positive) amplifying risk. Over half of the deaths (58.4%) occurred in the first month of treatment.
Conclusions: In high-volume, faith-based hospitals in Kampala, EPTB is a risk factor for TB mortality. The high mortality in the first month could be attributed to delayed or misdiagnosis. Enhancing EPTB-targeted diagnostics such as lateral flow LAM assays and molecular tests to address diagnostic gaps, especially in the first 28 days of diagnosis in these facilities, may reduce mortality among EPTB patients.

EP22-914-19 Tuberculosis-related sepsis is associated with increased in-hospital mortality across Universal Vital Assessment mortality risk score groups in adults in Mbarara, Uganda

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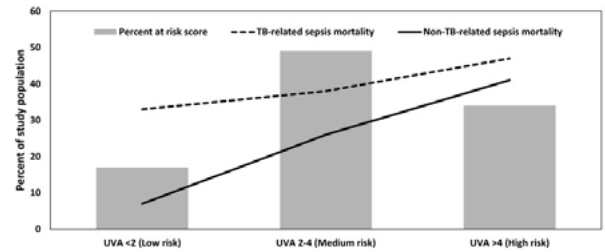
Background: Tuberculosis (TB) is the leading cause of sepsis, which is the leading cause of global death with the highest burden found in Africa. The clinical Universal Vital Assessment (UVA) mortality risk score identifies patients at risk of in-hospital mortality in Africa. We determined the association between TB-related sepsis and in-hospital mortality stratified by UVA mortality risk score groups among participants with sepsis in Uganda.
Design/Methods: We analyzed data from adult participants with severe sepsis enrolled at the Mbarara Regional Referral Hospital in Uganda from October 2014 through May 2015. We compared in-hospital mortality between participants with and without TB-related sepsis in low, medium, and high UVA mortality risk score groups at 6 hours post-admission.
Results: Among 192 participants, the median (IQR) age was 34 (27-47) years, 99 (50%) were female, and 116 (59%) were living with HIV. The case fatality rate was 31%. There were 51 (27%) participants who were admitted with TB-related sepsis; 18 (9%) had a pre-admission TB diagnosis and 33 (17%) were newly diagnosed with TB. Of these 51, 21 (41%) died compared to 38 (27%) of 141 without TB (odds ratio [OR] 1.9, 95% confidence interval [CI] 0.97-3.7, p=0.06). The in-hospital mortality for participants with TB compared to those without TB in low, medium, and high UVA score risk groups was 33% vs. 7%, 38% vs. 26%, and 47% vs. 41%, respectively (Figure 1). Of the 33 with newly diagnosed TB, 11 (33%) died compared to 48 (30%) of 159 without newly diagnosed TB (OR 1.2, 95% CI 0.52-2.57, p=0.77).

Figure 1. The prevalence of UVA risk score groups at 6 hours post-admission and associated case fatality rates according to TB diagnosis among participants with sepsis in Uganda



Conclusions: Adults with TB-related sepsis were at higher risk of death compared to those without TB even after stratifying for severity of illness. A high index of clinical suspicion for TB, improved TB diagnostics, and more efficacious anti-TB therapies are urgently needed for patients with sepsis in Africa.

EP22-915-19 Lung versus genital symptoms: Which better predicts female genital tuberculosis?

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Background: Female genital tuberculosis (FGTB) is a severe form of tuberculosis (TB) that generally occurs secondary to pulmonary or extrapulmonary TB (EPTB). It can spread directly from nearby organs or through hematogenous and lymphatic pathways from pulmonary TB. Genital symptoms may also be a predictor, but this suspicion has never been verified. Our study aimed to compare which preceding diagnosis is better for predicting FGTB between genital symptoms and lung symptoms.
Design/Methods: We retrieved records of FGTB (ICD-10 codes: A18.1, N74.0, N74.1, N77.0) from the Thailand national hospital admission database named the THIP database during 2017 to 2022. We applied a case-control

study design. For each of the above cases, we matched with four non-genital EPTB and four randomly chosen non-TB cases based on age, month and year of admission, and health region. A P-value <0.05 indicated a significant difference for each preceding disease.

Results: We identified 67 FGTB cases. Half of the patients were between 31 and 60 years old, and three-quarters were married or ever married. With a small sample size of some ICD-10 codes, FGTB had higher odds of having a previous genital problem admission (N73) than both EPTB and non-TB groups.

Such significant differences were also observed for N71, N80, and N93 when FGTB was compared against EPTB but not against non-TB. The odds of having a lung symptom admission in the past were not significantly different among the three groups.

Table 1 Top 5 of genital (N-code) and lung symptoms (J-code) preceding female genital tuberculosis (FGTB) compare to other extrapulmonary (EPTB) and non-tuberculosis (non-TB) diagnosis

ICD10	Diagnosis	67 FGTB	268 EPTB	OR (95% CI)*	268 non-TB	OR (95% CI)*
N73	Other female pelvic inflammatory diseases	6	0	N/A**	5	5.1 (1.3-22.02)**
N83	Noninflammatory disorders of ovary, fallopian tube and broad ligament	3	1	12.4 (0.97-656.7)	4	3.08 (0.4-18.7)
N71	Inflammatory disease of uterus, except cervix	2	0	N/A**	1	8.1 (0.4-484.8)
N80	Endometriosis	2	0	N/A**	4	2.02 (0.18-14.5)
N93	Other abnormal uterine and vaginal bleeding	2	0	N/A**	2	4.07 (0.29-57.04)
J10	Influenza due to identified seasonal influenza virus	1	0	N/A	2	2.01 (0.03-39.1)
J15	Bacterial pneumonia, not elsewhere classified	0	10	0 (0-1.7)	3	0 (0-9.7)
J17	Pneumonia in diseases classified elsewhere	0	7	0 (0-2.7)	0	N/A
J18	Pneumonia, organism unspecified	1	16	0.24 (0.005-1.6)	12	0.3 (0.007-2.3)
J45	Asthma	1	2	2.01 (0.03-39.1)	6	0.66 (0.01-5.6)

* 95% confidence limits computed by exact method
**statistically significant from two-tailed Fisher's exact test

Conclusions: Genital symptoms can be a better predictor for FGTB than lung symptoms. FGTB should be investigated more carefully in women hospitalized with genital problems in TB-endemic areas.

EP22-916-19 Prevalence and associated factors of active tuberculosis among IGRA-negative population

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Background: Tuberculosis (TB) remains a global public health challenge, necessitating early diagnosis. Although interferon-gamma release assays (IGRA) aid in detecting TB infection, current research predominantly focuses on evaluating the sensitivity and specificity of positive results for diagnosing latent tuberculosis infection (LTBI) and active tuberculosis (ATB), as well as investigating host-related factors and immunological mechanisms contributing to false-negative results.

In contrast, studies exploring diagnostic strategies for IGRA-negative populations with ATB remain limited, particularly regarding the identification of clinical characteristics and risk factors specific to this subgroup, highlighting the need to investigate prevalence and predictors in this population.

Design/Methods: This retrospective study analyzed 407 IGRA-negative patients from Changsha Central Hospital (September 2022–January 2023). Active TB prevalence was assessed, and potential predictors were identified through comparative analysis and multivariate logistic regression.

Results: The active TB prevalence was 13.27% (54/407), with 68.5% (37/54) confirmed microbiologically and 31.5% (17/54) clinically diagnosed. Pulmonary TB accounted for 83.3% (45/54), extrapulmonary TB for 5.6% (3/54), and combined cases for 11.1% (6/54). Key imaging features included lung cavitation (31.5%) and pleural effusion (31.5%).

Multivariate analysis identified seven independent predictors: occupation (social workers: OR=0.448, 95% CI: 0.222-0.904), weight loss (OR=2.944, 95%CI: 1.407-6.159), positive purified protein derivative (PPD) skin test (OR=5.758, 95%CI: 2.597-12.766), lung cavitation (OR=4.245, 95%CI: 1.946-9.263), pleural effusion (OR=2.851, 95%CI: 1.369-5.939), eosinopenia (OR=2.337, 95%CI: 1.109-4.925), and renal dysfunction (OR=2.561, 95%CI: 1.030-6.369).

Variables	β	S.E	Z	Waldχ²	P	OR	95%CI
social workers	-0.803	0.358	-2.241	5.021	0.025	0.448	0.222~0.904
weight loss	1.080	0.377	2.866	8.216	0.004	2.944	1.407~6.159
positive PPD skin test	1.751	0.406	4.309	18.566	0.000	5.758	2.597~12.766
lung cavitation	1.466	0.398	3.632	13.192	0.000	4.245	1.946~9.263
pleural effusion	1.048	0.374	2.799	7.834	0.005	2.851	1.369~5.939
eosinopenia	0.849	0.380	2.233	4.986	0.026	2.337	1.109~4.925
renal dysfunction	0.940	0.465	2.023	4.091	0.043	2.561	1.030~6.369

OR: Odds Ratio, CI: Confidence Interval

Table. Factors Associated with Active Tuberculosis Diagnosis in IGRA-Negative Populations: Multivariable Analysis

Conclusions: A non-negligible proportion of active TB occurs in the IGRA-negative individuals. Occupation, weight loss, lung cavitation, pleural effusion, TST positivity, eosinopenia (<0.05×10^9/L), and renal dysfunction may serve as independent predictors of active tuberculosis disease in the IGRA-negative population.

EP23 Unravelling Progress: The fallout of donor funding and accountability

EP23-917-19 Impact of USAID funding suspension on TB case detection in Cambodia: A critical setback

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health concern in Cambodia, with an estimated 35% of TB cases undiagnosed due to limited access to diagnostic tools, insufficient healthcare resources, and gaps in service provision. Effective case detection is vital to reduce TB transmission, but challenges in screening efforts persist, especially in remote areas.

Intervention or response: The Community Mobilization Initiatives to End Tuberculosis (COMMIT) project, funded by USAID, was implemented to enhance TB case detection, prevention, and treatment in Cambodia. The initiative utilized community-based screening methods, including chest X-rays and Xpert MTB/RIF testing, to ensure early and accurate TB diagnosis. The project aimed to reach remote and underserved populations across 27 Operational Districts (ODs).

However, USAID terminated funding on January 25, 2025, significantly impacting TB screening activities in these regions.

Results/Impact: An analysis of TB case detection from Q1-2024 to Q1-2025 highlights the consequences of the funding disruption. In Q1 of 2024, when USAID was actively funding the program, 1,858 TB cases were detected, including 958 Bac+. Monthly detections were 581 in January, 578 in February, and 699 in March. After the funding suspension, case detection sharply declined. In January 2025, USAID-funded activities were still ongoing until January 25, resulting in 387 cases. However, after the suspension, case fell to 288 in February (50.17% decrease) and 214 in March (69.40% decrease), resulting in a 52.15% total decrease in detected cases compared to the previous year.

Conclusions: The suspension of USAID funding has led to a dramatic reduction in TB case detection, with over 50% fewer casesidentified in 2025 compared to 2024. This decline underscores the urgent need for alternative funding sources to maintain active screening programs and ensure continued TB case detection and control in Cambodia. Without immediate intervention, the disruption may hinder efforts to control TB and increase the risk of undiagnosed and untreated cases.

EP23-918-19 Enhancing performance management and accountability in TB program implementation: The AIM 250 experience

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Background and challenges to implementation: Nigeria has made commendable strides in strengthening its tuberculosis (TB) control program, particularly through expanded investments, strategic partnerships, and innovative interventions. However, like many large-scale public health programs, there remains room to enhance the consistency and timeliness of data reporting, accountability mechanisms, and real-time performance monitoring especially at sub-national levels where programmatic complexity increases.

Intervention or response: In response, the AIM 250 (working days) platform was introduced in early 2023 as a novel digital and performance accountability tool. The tool integrates a routine performance monitoring framework with adaptive intelligence and was anchored on weekly and monthly survey submissions by Cluster Coordinators and State Technical Officers (STOs). These surveys track key indicators, feeding into a centralized dashboard used for real-time supervision and gap identification. Quantitative data were collated and analyzed using Microsoft Excel, focusing on four primary metrics: Platform Adoption, Capturing Compliance, STO Adherence Rate, and Data Quality

Results/Impact: The results demonstrate a significant improvement in compliance and adoption after onboarding additional teams. Vantage Platform Adoption was initially low at 17% (Sept-Oct) but increased to 58% in Nov and 92% in Dec. Capturing Compliance rose from 44% in Sept to 67% in Dec, while Data Quality (Completeness) improved from 46% to 100% over the same period.

STO Adherence Rate remained stable at 83% initially but reached 100% in Dec. Similarly, Data Quality (Accuracy) improved from 76% in Oct to 95% in Dec. The structured reporting cycle and adaptive intelligence framework enabled state teams to track progress, identify gaps, and implement targeted interventions, leading to improved responsiveness and coordination.

Conclusions: AIM 250 has proven to be a transformative tool in TB program performance management, significantly enhancing data-driven accountability and managerial oversight.

The observed improvements in compliance and data quality following increased platform adoption highlight the importance of structured performance monitoring in optimizing program outcomes.

EP23-919-19 Leveraging the Multi-Sectoral Accountability Framework to accelerate TB elimination in Uganda: Political commitment, policy integration, and cross-sector collaboration

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Background and challenges to implementation: In 2020, Uganda adopted the WHO Multi-Sectoral Accountability Framework for Tuberculosis (MAF-TB) to enhance political commitment, institutional accountability, and cross-sectoral collaboration in the fight against Tuberculosis. The Prime Minister championed Tuberculosis elimination, urging Ministries, Departments, and Agencies (MDAs) to integrate Tuberculosis interventions into Programme Implementation Action Plans (PIAPs). However, inadequate funding, poor coordination, persistent stigma, and slow policy adoption hindered full implementation, requiring ongoing political advocacy and reforms at the systems level.

Intervention or response: To operationalise MAF-TB, Ministry of Health (MoH), with support from USAID, WHO, and Global Fund, leveraged high-level political advocacy to establish the Prime Minister as a national TB champion. In response, 13 MDAs incorporated TB activities into 2024/25 work plans and budgets, allocating over UGX 1.8 billion towards workplace Tuberculosis service delivery interventions. MoH integrated TB screening into national HIV workplace policies and social protection schemes, widening access in occupational settings. Office of the Prime Minister facilitated intersectoral coordination, established accountability mechanisms, and organised annual stakeholder forums to align priorities, monitor progress, and strengthen multi-sector responsibility.

Results/Impact: High-level political commitment catalysed the national adoption of workplace TB interventions and resource mobilisation. 13 MDAs formally incorporated Tuberculosis programming into their sectoral plans and budgets. Over UGX 1.8 billion was allocated for workplace Tuberculosis activities in FY2024/25. 17,359 employees were screened; 6,770 presumptive cases were tested, identifying 192 tuberculosis-positive individuals, all linked to care. Tuberculosis was integrated into the National HIV Workplace Policy, leading to increased awareness and screenings among high-risk workforces. National Tuberculosis Stakeholders' Conference fostered cross-sector accountability and learning, enhancing the policy implementation momentum.

Conclusions: Uganda's implementation of MAF-TB exemplifies the transformative potential of political leadership, intersectoral policy reform, and integrated financing in accelerating the elimination of tuberculosis. By embedding tuberculosis interventions into workplace governance frameworks, Uganda offers a scalable, accountable model for sustainable Tuberculosis control and cross-sectoral impact.

EP23-920-19 Development of a multistakeholder accountability framework for tuberculosis control: A case study from Liberia

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Background: Tuberculosis (TB) remains a leading cause of morbidity and mortality in Liberia, with an estimated incidence rate of 308 cases per 100,000 population and a treatment success rate of only 78% (WHO, 2023). Despite existing national strategies, Liberia faces persistent challenges in achieving WHO End TB targets, primarily due to fragmented stakeholder coordination, limited community engagement, and weak accountability mechanisms.

This study aims to develop a multistakeholder accountability framework to enhance TB control outcomes by fostering coordinated action and transparency among key actors.

Design/Methods: A qualitative case study design was utilized, incorporating 30 key informant interviews with representatives from the Ministry of Health, National Public Health Institute of Liberia (NPHIL), WHO, Global Fund partners, and community organizations.

The study also conducted a desk review of TB policies, National Strategic Plans, and surveillance reports (2018–2023). Thematic analysis identified accountability gaps, while pilot testing of the proposed framework assessed its impact on TB indicators over a 12-month period.

Results: Analysis revealed systemic gaps in governance, with 40% of stakeholders reporting unclear role delineations and 35% citing inadequate financial tracking mechanisms. Community engagement in TB care was limited, with only 25% of community health workers actively involved in case detection.

The proposed framework, incorporating structured governance models, performance monitoring, and community accountability forums, led to a 20% increase in case detection rates (from 67% to 87%) and improved treatment success rates to 90%. Stakeholder collaboration scores, assessed via standardized surveys, improved by 30%, reflecting enhanced coordination.

Conclusions: The implementation of a robust multistakeholder accountability framework significantly improved TB control outcomes in Liberia, demonstrating the critical role of coordinated governance, transparent reporting, and community participation.

Adoption of similar frameworks in comparable low-resource settings could accelerate progress toward global TB elimination targets, supporting resilient health systems in line with WHO's End TB Strategy.

EP23-921-19 Volatile funding in fight to tuberculosis: Dilemma in LMICs – Bangladesh context

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Background and challenges to implementation: Sustainable financing is prerequisite to achieve END TB target. Bangladesh is a TB high burden low- and middle-income country (LMIC) despite significant progress in TB prevention and care. This is mostly due to funding insufficiencies, which jeopardize TB targets, making affordability and accessibility difficult for disadvantaged groups. At the same time, there is a need to balance enhanced domestic resource mobilization with external assistance.

Intervention or response: This study focused to address mentioned funding challenges on financial constraints, donor dependence, and domestic funding barriers. It also explored potential solutions, including innovative financing and public-private partnerships to align with END TB target. During January to February 2025, desk review of National Program's Annual reports, National Strategic Plan (NSP), Joint Monitoring Mission (JMM) recommendations, Donor vs Domestic budget mapping, interviewing relevant focal persons from Government, implementing NGO Partners, Donor representatives were done.

Results/Impact: Findings indicate that, domestic funding is still limited to 39% and rest depends on external sources like The Global Fund and USAID. During last decade, domestic finance increased very slowly. Still there is 40% funding gap as per NSP. From 2021 to till date, commodities like molecular WHO-recommended rapid diagnostic (mWRD) tests, diagnostic kits, reagents, TB drugs, tuberculosis preventive treatment (TPT) drugs, capacity development, and an abundance of human resources funded by donors. Reducing donor dependency requires stronger domestic resource mobilization through increased government funding, corporate contributions, and private-sector investments. Innovative financing models like tax-based health financing, social health insurance, and results-based funding should be explored. Integrating TB services into Universal Health Care and ensuring strong political commitment are essential for sustainable, accessible, and affordable TB care.

Conclusions: Multifaceted strategy can address Bangladesh's TB financing issues, including more government sensitization for funding, sustainable financing mechanisms and increase private sector engagement. This scenario is more or less similar in all LMICs.

EP23-922-19 Health financing – The two-year planning cycle, simplified planning formats and conditionality-based incentives in India's TB program. Innovation from India

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Background and challenges to implementation: The National Health Mission (NHM) is key to achieving the National Health Policy and Sustainable Development Goal 3 (SDG-3). It focuses on improving primary health care, ensuring Universal Health Coverage (UHC), and

eliminating tuberculosis (TB). The National TB Elimination Program (NTEP) implements TB strategies at national and state levels through Programme Implementation Plans (PIPs). The disconnect between funding and state performance was a major challenge in Health financing, reducing accountability and results. .In 2022, NHM introduced reforms such as a two-year planning cycle and performance-based funding. The new, data-based approach showed strong results, leading to a countrywide increase in TB notifications from 70.2% in 2022 to 89.9% in 2024. This approach enhances state planning and effectiveness in TB elimination efforts.

Intervention or response: Given this background, in 2024, reforms were introduced for the PIPs such as (i) Two-Year Planning, (ii) Simplified Planning Format, (iii) Focus on Key Deliverables (iv) NTEP Key Conditionalities. NTEP performance was analyzed to assess this strategy's effectiveness using Ni-kshay data (India's TB digital surveillance system).

Results/Impact: After implementing the new strategy, TB notification data from 2021 to 2024 showed improved target achievement: 70.2% in 2022, 86.4% in 2023, and 89.9% in 2024—a total increase of 19.8 percentage points. Linking funding to performance through conditionality effectively enhanced the program, particularly in states of Ladakh, Uttar Pradesh, and Tripura.

Conclusions: India's performance-based funding model and enhanced planning system have significantly improved the TB program's performance. This approach promotes efficient resource use, accountability, and continuous improvement among states. As countries seek effective disease elimination strategies, this results-oriented model offers a strong global example.

EP23-923-19 Rethinking the TB funding landscape in Pakistan: From donor dependency to domestic leadership

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Background: Pakistan is the world's fifth highest TB burden country, with an estimated burden of 686,000 cases in 2023. Despite this, the domestic investment is only 5.5% of all TB financing (Global TB Report 2024). The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM) remains the primary donor, contributing 32%, with a budget gap of 63%, undermining sustainability. A strategic review of GFATM funding in Pakistan was commissioned by Ministry of National Health Services, Regulation and Coordination, including an in-depth review of TB funding landscape.

Design/Methods: This financial review was embedded within a broad strategic review of GFATM in Pakistan. Desk-review of financial data provided by government, donors and development partners was conducted, followed by 232 key informant interviews. Financial quantitative analysis was conducted using MS Excel to assess funding flows and resource allocation and carry out fund flow mapping to identify and align funding sources

Results: GFATM has disbursed approximately USD 710 million for TB in Pakistan since 2004 (Figure-1), making it the largest source of TB funding. From 2016–2023, donor funds made up 80% of TB financing, while the government contributed around 20%. Fund absorption has improved over time, with ≥80% utilization in recent cycles. An approximately 15% of funding is allocated to human resources, 60% to pharmaceuticals, and less than 1% to communication. There is 100% reliance of donor funding for anti-TB medicines and 90% diagnostics are resourced by GFATM**.** The mandate for TB program governance lies with Country Coordinating Mechanism (CCM) and Common Management Unit (NTP), though both face structural challenges and weakened authority. The CMU relies on GFATM to pay its nearly 400 staff.

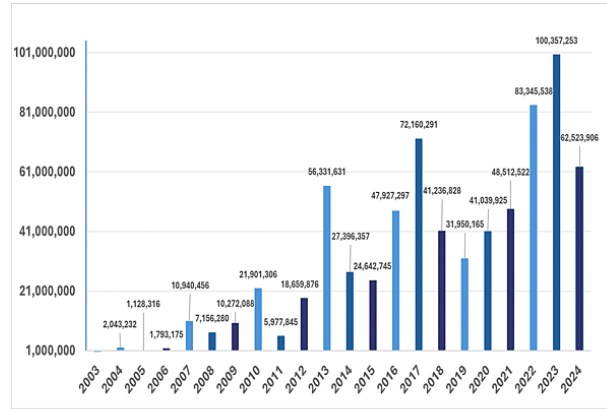

Figure 1 : TB funding by GFATM to Pakistan

Conclusions: While donor support has expanded access and improved outcomes, increased government financing and stronger institutional ownership are urgently needed, especially in the face of recent donor freezes and shifting geopolitical priorities.

EP23-924-19 TB funding in Nigeria: The politics of resource allocation, donor dependence, and accountability challenges

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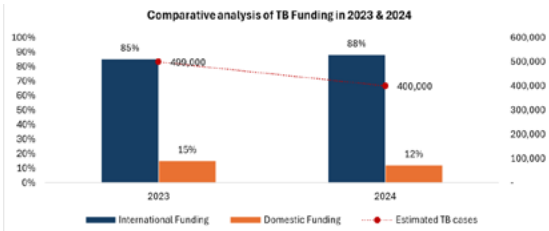
Background and challenges to implementation: With an estimated 499,000 cases reported in 2023, Nigeria ranks highest in tuberculosis (TB) burden in Africa and sixth globally. Despite this, the country's TB control efforts face significant financial challenges, with a funding gap of 60% in 2024. This study examines the political dynamics influencing TB funding in Nigeria, focusing on resource allocation, donor dependence, and accountability mechanisms.
Intervention or response: A comprehensive desk review of funding reports and relevant literature was conducted to analyze the trends and challenges in TB financing in Nigeria. The 2024 WHO Global Tuberculosis Report was examined to compare trends in TB financing and its influence on TB case notification.
Results/Impact: In 2024, Nigeria required $393 million for TB control; however, only 39.8% of this budget was funded, leaving a 60% unfunded gap of approximately $236 million. Domestic contributions accounted for 12%, a shortfall of 3% from a 15% contribution in 2023, while 88% came from international donors, a 2% increase from an 85% contribution in 2023. These findings reveal a heavy reliance on foreign aid, which poses sustainability risks for TB control programs. For instance, the suspension of U.S. health aid in early 2025 created a $5 million shortfall in Q1 2025 alone. Delays and inconsistencies in fund disbursement and the absence of specific TB legislation were cited as major threats to TB funding and efficient resource utilization.



Conclusions: Bridging Nigeria's TB funding gap and reducing donor dependence requires increased domestic investment and strong political commitment. The involvement of influential figures as TB advocates and ambassadors, such as the Nigerian First Lady, who has donated N2 billion ($1,285,718.88) from her foundation within one year to the fight against TB, has become exemplary. Establishing legal and institutional frameworks will also improve transparency and accountability in the disbursement of funds to achieve sustainable TB funding towards the ENDTB goals.

EP24 Frontiers in immunology and biomarkers - infection, disease risk and treatment monitoring

EP24-925-19 Impact of maternal helminth infection and *MTB* exposure on neonatal IgE, maternal and neonatal IgG immune profiles

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Background: Maternal helminth infections and Mycobacterium tuberculosis (*MTB*) exposure may influence maternal and neonatal immune responses, potentially impacting susceptibility to infectious and allergic diseases. This study investigates the relationship between maternal helminth infection, *MTB* exposure (via Quantiferon [QFT] testing), and immune profiles in mothers and neonates.
Design/Methods: A comparative cross-sectional study was conducted on 87 mothers, purposively grouped into helminth-infected (n=36) and helminth-negative (n=51) cohorts, and their neonates. Participants were further stratified by QFT status to assess *MTB* exposure. Stool samples were examined using a wet mount and kato-katz to identify helminth species and egg counts. *MTB*-specific IgG was measured in maternal venous and cord blood samples. Moreover, the total IgE levels of the neonates were measured. SPSS and Graph pad prism were used for data analysis, and Mann-Whitney U tests determined statistical significance ($P<0.05$)
Results: Among the helminth-infected group (n=36), *Taenia spp.* 13 (36.1%) and hookworm 12 (33.3%) were the predominant parasites. Of all QFT-tested participant mothers, 14 (16.1%) were QFT-positive and 63 (72.4%) were QFT-negative. Neonates born to helminth-infected mothers exhibited higher IgE levels than those of helminth-negative mothers ($P=0.04$). QFT-positive mothers were associated with lower neonatal IgE levels ($P=0.02$) and higher *MTB*-specific IgG levels ($P=0.01$). For hookworm-infected mothers, lower egg counts (<72 eggs/g stool) correlated with higher maternal IgG levels ($P=0.01$). However, egg counts did not significantly influence maternal IgG levels in Taenia spp. infected mothers.
Conclusions: Maternal helminth infection and *MTB* exposure significantly influence maternal and neonatal immune profiles. Helminth infection was linked to increased neonatal IgE, while maternal QFT positivity correlates with higher neonatal *MTB*-specific IgG. These findings highlight the complex interplay between maternal infec-

tions and neonatal immunity, emphasizing the need for further research to explore underlying mechanisms and their implications for susceptibility to infection and immune development

EP24-926-19 Regulation of TIM-3 expression in macrophages by IκBζ during Mycobacterium tuberculosis infection: Mechanisms and functional implications

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Background: Macrophage (Mø) activation and their induction of type I immune responses are pivotal for host control of tuberculosis (TB); however, TIM-3 expression in Mø significantly suppresses their activation. Therefore, elucidating the regulatory factors and mechanisms governing TIM-3 expression in Mø holds critical innovative value for advancing TB prevention and therapeutic strategies.
Design/Methods: Using single-cell sequencing technology, RNA-seq, and other methods, we detected the expression levels of immune molecules and transcription factors associated with cellular characteristics and functions in various subpopulations of bone marrow-derived macrophage (BMDM) cells.
We further analyzed the correlation between IκBζ and TIM-3, as well as their associations with macrophage characteristics and functions.
Results: Single-cell sequencing analysis revealed that IκBζ expression levels are higher in pro-inflammatory M1-like Mø compared to M2-like Mø. Treatment with the cytokine IL-36γ significantly upregulated *Nfkbiz* (encoding IκBζ) and suppressed *Havcr2* (the gene encoding TIM-3) in TB antigen-stimulated Mø, accompanied by a marked increase in pro-inflammatory effector molecules and associated transcription factors.
Knockout of the *Nfkbiz* gene led to a significant rise in *Havcr2* expression and a pronounced decrease in pro-inflammatory effector molecules and transcription factors in TB antigen-stimulated macrophages.
Conclusions: IκBζ is a critical transcription factor that suppresses TIM-3 expression. Enhancing IκBζ through appropriate strategies, such as IL-36γ treatment, may inhibit TIM-3 expression, thereby mediating the enhancement of macrophage activation and effector functions.

EP24-927-19 Biomarkers for Asymptomatic TB Diagnostisis

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Background: Tuberculosis (TB), continues to be a major global health challenge, particularly due to the difficulty in identifying asymptomatic. These individuals carry the bacteria without clinical symptoms but at risk of contributing to transmission. Current diagnostic tools like the Tuberculin Skin Test (TST) and Interferon-Gamma Release Assays (IGRAs) have limited ability to accurately identify and differentiate asymptomatic TB cases from latent cases. Recent advances in immunology suggest that addition of HLADR aid Mtb specific immune cell subsets ability to distinguish latency versus active disease including recent exposure, although this is promising is has not yet shown in asymptomatic TB and with and without HIV presence. Strengthening the evidence of HLADR in mtb specific biomarker drive efforts for this to get clinical test and use.
Design/Methods: Peripheral blood mononuclear cells (PBMCs) were isolated from individuals with asymptomatic TB and matched community controls to investigate immune activation profiles. A T-cell antigen-specific activation assay was performed to assess functional immune responses. Panel of fluorescently labeled antibodies targeting activation markers and lineage-specific surface and intracellular proteins were used enabling the identification of unique immune subsets and activation patterns.
Results: In the absence of HIV co-infection, HLA-DR expression on M. tuberculosis-specific T cells effectively distinguished individuals with asymptomatic TB from community controls, indicating its potential as a diagnostic marker in HIV-negative populations. However, this discriminatory capacity was lost in the presence of HIV. Th17 cell subsets did not show significant differences between groups, irrespective of HIV status.
Interestingly, individuals with asymptomatic TB exhibited elevated levels of double-negative memory B cells compared to controls. Other lymphoid populations remain unchanged although there is elevated activation in the asymptomatic TB.
Conclusions: HLA-DR expression can distinguish asymptomatic TB in HIV-negative individuals, while broader immune profiles remain largely unchanged but with elevated antigen-specific inflammation in the asymptomatic TB.

EP24-928-19 Lens-free shadow imaging technology-based quantification of T cell activation for latent tuberculosis diagnosis

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Background: Latent tuberculosis infection (LTBI) remains a significant global health challenge affecting approximately one-fourth of the world's population. Current diagnostic methods rely on T cell-based immunologic assays such as Interferon-Gamma Release Assay (IGRA), which detect memory T cell responses to *Mycobacterium tuberculosis*-specific antigens. However, these methods require extended incubation periods (>24 hours), expensive reagents, specialized equipment, and trained personnel, limiting their accessibility in resource-constrained settings. This study introduces a novel lens-free shadow imaging technology (LSIT) that quantifies T cell activation through label-free morphological analysis at the single-cell level, offering a rapid and cost-effective diagnostic alternative for LTBI detection.
Design/Methods: Peripheral blood samples were collected from QuantiFERON-TB Gold classified LTBI-positive and negative individuals. Blood samples were incubated in QuantiFERON-TB's Nil, TB antigen, and Mitogen tubes with added co-stimulatory antibodies (CD28/CD49d) for 6 hours at 37°C. Following incubation, $CD4^+$ T cells were isolated and analyzed on the LSIT platform. Morphological parameters were extracted from single-cell shadow images and compared between groups and stimulation conditions.
Results: All participants exhibited significant increases in LSIT-derived parameters (CMV, PPD, MMD, MMD_SD, WCM_SD) in the Mitogen group compared to Nil controls, validating general T cell responsiveness to stimulation. Notably, only LTBI-positive individuals showed significant increases in MMD_SD in the TB antigen group compared to Nil, indicating antigen-specific memory T cell activation.
Conclusions: This LSIT-based platform enables rapid, label-free, and quantitative assessment of T cell activation at the single-cell level through morphological analysis. The technology demonstrates strong potential as a cost-effective diagnostic tool for LTBI detection, especially in resource-limited settings. By eliminating the need for specialized reagents, reducing incubation time, and providing quantitative results, this approach may complement or improve upon current IGRA-based diagnostics, contributing to more effective tuberculosis control and prevention strategies.

EP24-929-19 Evaluation of absolute monocyte to lymphocyte ratio in peripheral blood as an index of tuberculosis in Lusaka, Zambia

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Background: The diagnosis of Tuberculosis (TB) remains challenging, highlighting the need for improved diagnostic and screening tools. The Monocyte to lymphocyte ratio (MLR) has emerged as a potential marker for TB infection. However, evidence for its clinical utility remains inconclusive. This study aimed to evaluate the effectiveness of MLR in peripheral blood as a measure of active TB.
Design/Methods: A cross sectional study was conducted at three health facilities in Lusaka, Zambia. Participants were divided into four groups: HIV positive active TB patients (TB/HIVp), HIV negative active TB patients (TB/HIVn), HIV positive TB patients on treatment for more than two months (TxTB/HIVp) and healthy volunteers without active TB and HIV (HV). Blood samples were collected for Full blood count (FBC), white cell differential count (DC), and other tests. Data analysis was performed using Stata Version 18, employing descriptive statistics, logistic regression and ROC curves to evaluate the Monocyte to Lymphocyte ratio.
Results: 177 participants were analysed and categorised into four groups; 45 TB/HIVp, 42 TB/HIVn, 44 TxTB/HIVp and 46 HV. Active TB patients (TB/HIVp and TB/HIVn) had significantly higher median MLR values (0.41 and 0.35 respectively) compared to the TxTB/HIVp (0.142) and HV (0.13) groups. Significant differences were noted between TB/HIVp vs. TxTB/HIVp, TB/HIVp vs. HV, and TB/HIVn vs. HV. An MLR of >0.187 discriminated TB/HIVp from HV with 86.67% sensitivity, 82.61% specificity, 83.28% positive predictive value and 86% negative predictive value. An MLR >0.205 differentiated TB/HIVp from TxTB/HIVn with 77.8% sensitivity,70.4% specificity, 72.3% positive predictive value and 76% negative predictive value. Low BMI and low CD4 count were associated with higher MLR values.
Conclusions: Monocyte to lymphocyte ratio is significantly increased by active TB and is thus a potential biomarker for TB screening.

EP24-930-19 A novel blood-based 3-gene signature score for treatment monitoring in rifampicin-resistant tuberculosis: Preliminary results

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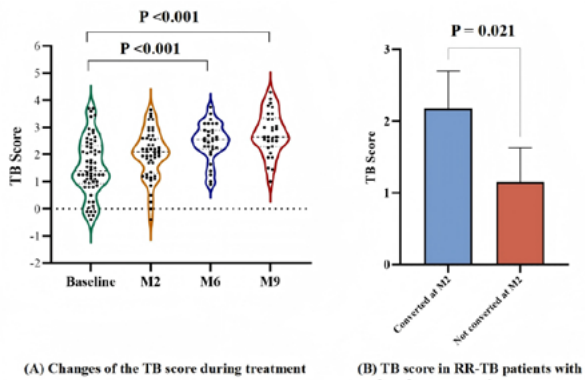
Background: A rapid, non-sputum-based test is urgently needed for tuberculosis treatment monitoring. We conducted a prospective cohort study to evaluate the performance of a blood-based 3-gene signature score (Xpert MTB-HR) for therapeutic monitoring in rifampicin-resistant tuberculosis (RR-TB).
Design/Methods: Patients aged 16–75 years with pulmonary RR-TB were prospectively enrolled and received a 9-month five-drug oral regimen comprising bedaquiline, linezolid, cycloserine, clofazimine, pyrazinamide, and a fluoroquinolone. Sputum cultures were obtained monthly, and venous blood was collected at baseline, month 2, month 6, and month 9 for the Xpert MTB-HR assay, which was performed according to the manufacturer's instructions. Cycle threshold for three genes (DUSP, GBP5 and KLF2) was obtained and the TB score was determined by: $(Ct_{GBP5} + Ct_{DUSP3})/2 - Ct_{KLF2}$.
Results: From May 2023 to February 2025, 67 patients were recruited. Thirty patients have completed treatment and no bacteriological failure has been reported so far. Two patients were lost to follow-up and three deaths occurred during treatment. The TB score gradually increased during treatment, with the most remarkable increase seen at month 6 (2.55 (IQR 2.20–2.90) vs. 1.40 (IQR 0.93–2.32), P <0.001) and month 9 (2.65 (IQR 2.29–3.35) vs. 1.40 (IQR 0.93–2.32), P <0.001) compared to baseline. The TB score at month 2 was higher in patients who achieved culture conversion compared to those with a positive culture ((2.18 (IQR 1.70–2.70)) vs. 1.15 (IQR 1.95–1.62), P = 0.021). The TB score demonstrated strong predictive performance for early culture conversion at month 2 compared with sputum culture, with an AUC of 0.812 (95% CI 0.666–0.958, P = 0.024). The optimal cut-off value was 1.30 with a sensitivity of 80.0% and a specificity of 81.0%.



(A) Changes of the TB score during treatment

(B) TB score in RR-TB patients with early culture conversion

Conclusions: This preliminary analysis suggested that the 3-gene TB score may serve as a biomarker for early culture conversion in RR-TB patients.

EP24-931-19 The value of platelet albumin ratio in monitoring treatment response and predicting time to culture conversion in patients with tuberculosis: A multicenter prospective study

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Background: Identifying patients with tuberculosis (TB) at high risk of delayed culture conversion was challenging, particularly in resource-limited settings. We explored the value of platelet albumin ratio (PAR), an inflammation biomarker based on routine laboratory examinations, in monitoring treatment response and predicting time to culture conversion.
Design/Methods: This was a sub-study of a multicenter randomized controlled trial (NCT05401071) in China. Participants with drug-susceptible TB were randomly assigned to receive the standard regimen or 4-month regimens.. Sputum culture, platelet count and serum albumin tests were conducted at baseline and at week 1, 2, 3, 4, 6, 8, 12, 17, 21, and 26 after treatment initiation. Culture conversion was defined as two consecutive cultures, taken at least 14 days apart, being found to be negative. Cox proportional-hazards model was employed to analyze factors of delayed culture conversion and calculate the risk score. The median value of the risk score was used to classify low-risk or high-risk group of delayed culture conversion.

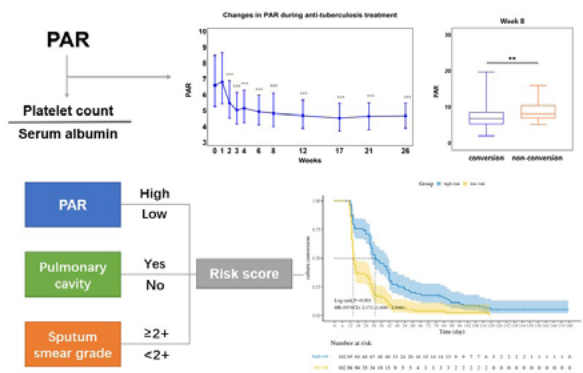

Figure1. PAR in monitoring treatment response and predicting time to culture conversion.

Results: A total of 204 patients with positive sputum culture were included, with the baseline median PAR of 6.58. The median PAR was significantly decreased at week 2 (5.48 vs. 6.58, P<0.001) compared to baseline and declined to 4.67 at week 26. The median baseline PAR of patients

without culture conversion at week 8 was significantly higher than patients with culture conversion (8.09 vs 6.72, P=0.003). Baseline PAR (aHR=0.90, 95%CI:0.85-0.95), cavity on pulmonary radiology (aHR=0.72, 95%CI:0.53-0.98), smear grade≥2+ (aHR=0.63, 95%CI:0.45-0.89) were independent risk factors of delayed culture conversion. The median time to conversion was 31 days (Interquartile range [IQR]: 14-44) in high-risk group, significantly longer than that (14 days, IQR:13-28, P<0.001) in low-risk group.
Conclusions: PAR significantly decreased after anti-TB treatment. The risk score based on baseline RAR, pulmonary radiology and sputum smear could identify patients at high risk of delayed culture conversion.

EP24-932-19 The value of SAT-TB in monitoring the early therapeutic efficacy of MDR/RR tuberculosis

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Background: MDR/RR tuberculosis treatment lack of rapid and effective monitoring methods. Current techniques, such as GeneXpert that cannot distinguish live from dead bacteria, MGIT™960 culture which required 42 days to get negative result, fail to meet the clinical demand for dynamic monitoring. SAT-TB detects the 16S rRNA that is highly expressed in live MTB, demonstrates potential in monitoring early therapeutic efficacy.
Design/Methods: A total of 125 MDR/RR-TB patients with baseline positive sputum MGIT™960 culture in Hangzhou Red Cross Hospital from January 2022 to October 2024 were included in the study. Sputum samples were collected from patients at the end of the first and second month of treatment. These samples were tested using sputum SAT-TB, acid-fast staining(AFS),and MGIT™960 culture. With MGIT™960 culture as the gold standard, the sensitivity, specificity, Kappa and AUC of ROC curve of SAT-TB and AFS were evaluated.
Results: Using MGIT™960 culture as the gold standard, The sensitivity of sputum SAT-TB and AFS in evaluating therapeutic efficacy was 87.1% and 54.8% at the end of the first month of treatment, with specificities of 100.0%and 98.9%. The Kappa values for SAT-TB and AFS were 0.910 and 0.626. The AUC values for sputum SAT-TB and AFS were 0.935 and 0.769(P=0.0006). At the end of the second month of treatment, the sensitivity of SAT-TB and AFS was 25.0%and 16.7%, with specificities of 100.0% and 98.2%. The Kappa values for sputum SAT-TB and AFS were 0.376 and 0.212. The AUC values for SAT-TB and AFS were 0.625 and 0.574 (P=0.2305).
Conclusions: At the end of the first month of treatment, sputum SAT-TB showed high consistency with MGIT™960 culture in evaluating therapeutic efficacy, indicating that sputum SAT-TB has certain application value in the early therapeutic efficacy evaluation of MDR/RR-TB.

EP24-933-19 Multiparameter flow cytometry and machine learning identify a predictive blood-based immune signature for tuberculosis diagnosis and treatment monitoring

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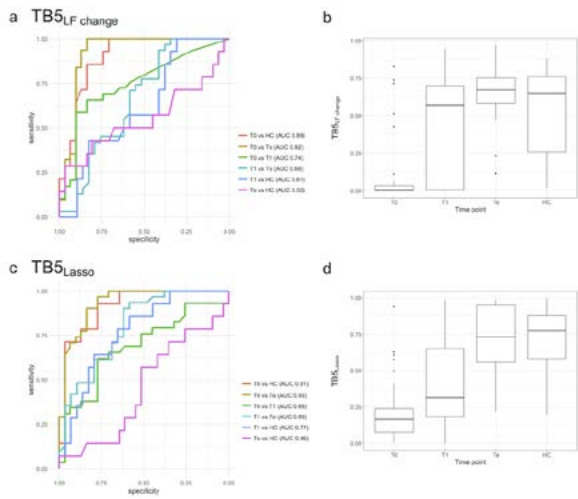
Background: There is increased interest in non-sputum-based biomarkers for the diagnosis and treatment monitoring of tuberculosis (TB).
Design/Methods: We conducted a prospective observational study in Germany, analyzing blood from 34 healthy controls (HC) and 51 TB patients at baseline (T0), after 14 days of therapy (T1), and at therapy end (Te). Using multiparameter flow cytometry, we profiled 386 immune cell populations and developed random forest models through two machine learning approaches.
Results: First, a log-fold change-derived $TB5_{LF\ change}$-score distinguished disease and treatment stages with high accuracy (AUC=0.89 for T0 vs. HC and 0.92 for T0 vs. Te), whereas performance was suboptimal at an early stage of therapy owing to its variability in T1. Its five populations exhibiting the greatest differences between T0 and Te included PD-L1$^+$CD80$^-$, PD-L1$^+$HLA-DR$^-$ and PD-L1$^+$ neutrophils, PD-L1$^+$CD80$^-$ monocytes, and PD-L1$^+$HLA-DR$^+$ CD4$^+$ lymphocytes.
Second, a LASSO-derived $TB5_{Lasso}$ score demonstrated superior diagnostic performance (AUC=0.91 and 0.93, respectively) and increased progressively with therapy. Two of five cell populations were identical in both scores:

PD-L1^{+}CD80^{-} neutrophils and PD-L1^{+}HLADR^{+} CD4^{+} lymphocytes. Additional $TB5_{Lasso}$-score populations included CCR4^{-}CXCR3^{+} CD4^{+} T cells, CD56^{+} Vd2^{+} gd T cells and CD56^{+} bright NK cells.

The $TB5_{Lasso}$-score correlated with clinical disease severity (r=–0.43, p=0.002), which was defined using seven clinical predictors selected based on effect size (alcohol abuse, active smoking, baseline smear grade, the presence of cavities, baseline fever, leukocytosis, and anemia) each associated with time to sputum culture positivity and conversion.



Conclusions: These findings suggest that cell populations associated with PD-L1-mediated immune exhaustion (neutrophils, CD4^{+} lymphocytes), early cytotoxic mycobacterial control (CD56^{+} Vd2^{+} gd T cells, CD56^{+} bright NK cells), and a Th1 immune response (CCR4^{-}CXCR3^{+}) define a comprehensive immunological signature varying with disease and treatment stages. This integrated signature represents a promising diagnostic and monitoring tool, warranting validation in larger and more diverse cohorts.

EP24-934-19 Influence of single nucleotide polymorphism of IL-10 (rs.1800896, -1082 A/G) On the risk of tuberculosis and drug resistance in Kaduna State, Nigeria

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Background: Comprehensive research to understand genetic factors influencing tuberculosis (TB) susceptibility and drug resistance is crucial to overcoming TB as a global health challenge. Single Nucleotide Polymorphisms (SNPs) could help identify genetic variations that influence susceptibility to TB and its treatment. Our study, to the best of our knowledge, investigated for the first time, the association between IL-10 (-1082 A/G) SNP and susceptibility to TB and TB drug resistance in Kaduna State, Nigeria. We aimed to determine the presence of IL-10 (rs.1800896, -1082 A/G) SNPs and their associations with age, sex and TB and drug resistance risk among TB patients in Kaduna state.

Design/Methods: A total of 140 participants, comprising drug-resistant TB (DR-TB) patients, drug-susceptible TB (DS-TB) patients, and Apparently Healthy controls (AHCs), were enrolled. Data collection involved medical records, structured questionnaire and genetic analysis. Genomic DNA was extracted, and SNPs were genotyped using PCR-based techniques. Associations between genotypes, alleles, age, and sex were analyzed. Odd ratios and Hardy-Weinberg equilibrium were employed for demographic and genetic analyses.

Results: Although overall, the AA genotype was the most expressed, in DR-TB, GG genotype and G allele were prevalent, with significant difference in genotypic and allelic frequencies of IL-10 (A/G) in DR-TB and AHCs [OR, 16.25; 95% CI (3.63–72.67); p = 0.0001] and [OR, 4.89; 95% CI (2.27–10.52); p = 0.0001], indicating potential associations with DR-TB risk. In DS-TB, similar trends were observed with GG genotype and the G allele posing a risk of almost 10 times and 3 times for TB respectively, highlighting potential genetic influences on susceptibility. Hardy-Weinberg equilibrium analysis revealed significant deviations in some groups, suggesting genetic variations.

Conclusions: Prevalence of specific genotypes and alleles indicates potential genetic markers for TB risk assessment. Findings underscore the importance of genetic factors in TB outcomes and advocate for tailored interventions for different populations.

EP25 Community wide systematic screening: Programmatic considerations

EP25-935-19 21st century challenges in scaling communityTB active case finding: Abnormal X-ray and negative mWRD?

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Background: Scaling community active case finding (ACF)for TB is a priority in high burden settings internationally. New tools havetransformed the landscape of ACF through ultra-portable x-ray, computer aided detection(CAD) and highly accurate molecular diagnostics. A challenge internationallyremains how to manage people with abnormal radiological presentation, with orwithout symptoms, who have a negative WHO-recommended rapid diagnostic test(mWRD). Studies demonstrate that this population have a high risk ofprogression and mortality, but the current evidence base to inform managementis limited and guidelines are arguably inadequate. Current guidance recommends exploringalternative diagnoses, repeat sampling or empirical treatment of severely illpatients.
Design/Methods: We prospectively followed-up a cohort of 302 patients identified during community ACF in Haryana, India with abnormal radiology and negative mWRD and undertook two further sequential mWRD specimensand repeat radiology (CAD) at 3 and 12 months on all patients.
Results: There was no statistically significantchange in mean CAD scores irrespective of microbiological outcome at either 3or 12 months post first negative mWRD. Second mWRD at 3 months yielded 4%positivity (12/302) and third mWRD at 12 months yielded an additional 4% positivity(11/290).
Conclusions: In total, 8% of the initially mWRD negative cohort tested positive on two further sequential molecular tests, representing a significant yield of active cases. This evidence supports the recommendation for sequential testing of patients with radiological abnormalities suggestive of TB who have an initial mWRD negative test result irrespective of symptoms. Our results also call into question the value of repeat imaging CAD score. Further studies are required to improve the management of ACF patients with an initial negative mWRD, including optimal frequency and duration of repeat testing for specific populations. These patients highlight the need for improved diagnostic tools relevant to early disease stages.

EP25-936-19 Bacterial and host determinants of cough aerosol culture-positivity in minimally symptomatic or asymptomatic patients with tuberculosis diagnosed during community-based active case finding

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Background: Preventing the spread of TB is critical to reducing the burden of TB disease. There is potentially a large reservoir of TB 'super-spreaders' present in the community that perpetuates amplification of the epidemic. Thus, transmission within the community will remain a problem unless these undiagnosed infectious cases are identified and treated. The overarching aim of this study was to identify alternative tools to detect TB infectiousness.
Design/Methods: We enumerated colony forming units (CFU) in aerosols (≤10μm) from 175 individuals diagnosed with tuberculosis (during community-based active case finding) and sampled using the cough aerosol sampling system (CASS; Andersen cascade impactor). Individuals with TB were either symptomatic or asymptomatic.
We compared microbiological, clinical, and radiological characteristics, performed sputum LAM (PATHFAST, PHC), 16S rRNA (TB-MBLA, StAndrewsUniversity), and blood transcriptomic profiling.
Results: 13.1% (n=23/175) with microbiologically-proven TB (Xpert and/or culture) were CASS+ve (probably infectious). 39.1% (n=9/23) of the CASS+ve individuals were smear-negative, contrasting with CASS+ve individuals passively diagnosed (7%; n=10/142 in a previous study). Symptomatic individuals (OR=7.6; p=0.03) and smokers (OR=6.0; p=0.0006) presented with greater odds of being CASS+ve.
Mycobacterial sputum smear-positivity (OR=24.5; p<0.0001), 16S rRNA level (OR=19.5; p<0.0001) and sputum LAM concentration (cut-off set at 200pg/mL; OR=35.3; p<0.0001), were strongly predictors of cough aerosol culture-positivity.
Sputum LAM had a sensitivity of 85% and specificity of 85% for CASS-positivity (cut-off 200pg/mL); for a sensitivity of 90%, corresponding specificity was 90% (400 pg/mL cut-off); and for a specificity of 95% corresponding sensitivity was of 65% (7700pg/mL cut-off).
Preliminary blood transcriptomic data revealed differential gene expression patterns observed between the groups (CASS positive versus negative).

Conclusions: Collectively, these data indicate that a significant proportion of community-based undetected individuals with TB are probably infectious with a high likelihood. Moreover, sputum LAM, sputum 16s RNA, and blood transcriptomic signatures are promising transmission-limiting tools to detect infectious TB in the community.

EP25-937-19 Repeated community-wide screening for tuberculosis: Impact on burden

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Background: Uganda has consistently implemented a community wide active case-finding screening and Testing(CAST) intervention, However the scale of implementation varied in some regions, in the country, some had a consistent full-scale implementation CAST since 2022, while other not, we explore the impact of CASTon TB burden.
Design/Methods: A generalized linear mixed model (GLMM), with negative binomial regression model using routine surveillance data, to estimate the prevalence ratio, adjusting for clustering by sub counties. To evaluate the effectiveness of active community wide screening we compared CAST (Intervention) with standard passive case detection (Control) alone to monitor for any changes in burden of tuberculosis. For intervention sub-counties were screened for pulmonary tuberculosis, regardless of symptoms, annually for 3 years from 2022, active community screening and Testing screening (CAST) was not performed in the 60 control sub counties in the first 3 years. The outcome, measured in the fourth year, was the Case notification rate of microbiologically confirmed pulmonary tuberculosis.
Results: We analyzed TB case notification rates (CNR) per 100,000 across 84 sub counties The CNR was (528 per 100,000 population) for Sub counties in the intervention group, and control group (245 per 100,000 from 2022 to 2024. The annual change in CNR for controls was not significant (rate ratio [RR] = 1.0069, 95%CI: 0.9448–1.0730, p=0.833). The intervention (more visits) did not significantly alter the trend in CNR decline between cases and controls (RR for interaction = 0.9353, 95% CI: 0.8558–1.0222, p=0.140). Baseline differences in CNR between cases and controls were also non-significant (p=0.137).
Conclusions: These findings indicate no substantial reduction in TB burden over the study period, nor a differential impact of the intervention, suggesting limited effectiveness of increased visits in reducing TB burden. Longer period for study or bigger studies may provide clues to this evidence.

EP25-938-19 Optimizing digital chest X-ray for TB screening: A process evaluation across South Africa

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Background: The World Health Organization recommends digital chest x-ray (dCXR) for tuberculosis (TB) screening. We evaluated current dCXR processes to identify bottlenecks and provide recommendations for more efficient deployment.
Design/Methods: A process evaluation of the screening procedures with dCXR were conducted at eight purposefully selected sites across five South African provinces between September–October 2024. The identified sites varied based on throughput (high and low), mode of operation (fixed and mobile) and on province. Data collection included staff interviews, observation, and historic data review. Observers documented process times, client numbers, queue lengths, and turnaround times. Journey time refers to the time between arrival and departure.
Results: Processes varied depending on team size and composition, highlighting the importance of optimising team structure for improved efficiency. Total journey time varied between 7-45 minutes.
Dual data capture on paper and digital tools resulted in the longest patient wait time (2-37 minutes) at the first step of the process while taking the dCXR had the shortest wait time (1-2 minutes). Teams with dedicated community engagement support staff performed better at processing and recruiting clients.
Key opportunities for improvement in process flow included:
1. A recommended team structure consisting of 2 people for registration, 1 person collecting sputum and 1 radiographer,
2. Improving data collection efficiency by simplifying screening tools (fewer data fields) and eliminating paper-based systems,
3. Investing in intranet solutions to address connectivity gaps,
4. Strengthen community mobilisation for demand planning, hotspot mapping and appropriate targeting, and;
5. Implement queue management systems.
Background and challenges to implementation: The World Health Organization recommends digital chest x-ray (dCXR) for tuberculosis (TB) screening. We evaluated current dCXR processes to identify bottlenecks and provide recommendations for more efficient deployment.

Conclusions: dCXR throughput is hindered by inefficient data capture and variable team support. Further research is required to assess if these key improvements in data collection, connectivity, community engagement, and queue management are recommended to enhance efficiency, reduce processing times and ultimately optimize TB yield.

EP25-939-19 Scaling TB elimination: High-yield community screening and detection strategies from South Africa's ACCELERATE program

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Background: South Africa bears one of the world's highest TB burdens, and facility-based TB detection is insufficient for elimination. To accelerate progress, the USAID-funded ACCELERATE (ACC1) program implemented three community-based active TB screening and detection strategies across seven high-burden districts in South Africa:
1. Mobile outreach,
2. Household contact tracing, and;
3. Digital chest X-ray (dCXR) screening.
These approaches were designed to enhance early detection, expand access, and strengthen TB prevention.
Design/Methods: We conducted a retrospective analysis of routinely collected programmatic data from March to December 2024. TB screening and sputum specimen collection were conducted by community healthcare workers.
Outreach and contact tracing data were recorded in real time using the Department of Health Information System 2 (DHIS2) application on tablets. dCXR screening data were input into the Lynx data system, with qXR used for image interpretation.
We calculated testing rate, test positivity, number of people diagnosed with TB, TB preventive treatment (TPT) initiation, and numbers needed to screen/treat (NNS/NNT).
Results: Across all strategies, over 200,000 people were screened, 2,875 were diagnosed, and 7789 people were initiated on TPT (see Table).
No individuals screened via dCXR were initiated on TPT, as system limitations prevented monitoring and documentation—a recognized implementation gap. Limited ability to produce sputum may have affected diagnostic testing across strategies.

Strategy	Screened	Tested	Testing Rate	Test Positivity	TB Detected	NNS	NNT	TPT Initiated
Outreach	170,709	43,098	25%	5.0%	2,172	79	20	1,198
Contact Tracing	13,86	11,074	80%	4.6%	510	27	21	6,591
dCXR	16,805	1,219/1,916 TB suggestive	64%	15.8%	193	87	6	—

Abbreviations: dCXR = digital chest x-ray, NNS = number needed to screen, NNT = number needed to treat, TPT = TB preventive treatment

Table. Outcomes by Community-Based Screening Strategy

Conclusions: Differentiated community-based TB screening and detection contributed to diagnosis and TPT initiation, highlighting the value of outreach beyond facilities. dCXR showed the highest test positivity (15.8%) and efficiency (NNT=6%). Contact tracing strengthened TPT uptake, while outreach expanded access. Findings demonstrate the value of integrated models. Scale-up should prioritize dCXR where feasible, alongside outreach and contact tracing. However, limited TPT initiation after dCXR and sputum collection challenges highlight the need for stronger systems and enhanced sputum collection strategies.

EP25-940-19 Strengthening health systems: The role of community health workers (CHWs) in improving access to TB and HIV services in Kano State, Nigeria

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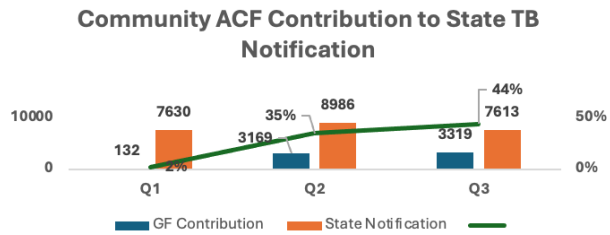
Background and challenges to implementation: Health systems are undergoing rapid and often unpredictable transformations**.** Community health workers (CHWs) have re-emerged as significant cadres in low-middle income countries and are now seen as an integral part of achieving the goal of universal health coverage. The deployment of CHWs has been advocated by WHO as a key strategy for reaching the most marginalized populations and reducing health inequities. We present results showcasing role of CHWs in improving access to TB and HIV services in Kano State.
Intervention or response: In April 2024, 760 CHWs were trained to conduct screening for TB, HIV, and syphilis, through house-to-house visits, outreach activities targeting underserved populations in slums, and IDP camps to identify presumptive TB cases for further evaluation and enrolment on treatment. Additionally, pregnant women in the community who are not attending antenatal care, are being screened and tested for HIV and syphilis ensuring complete referrals for positive pregnancies and provided with follow-up care until 18 months postpartum. Data from Jan-Sep 2024 was collated and analyzed.

Results/Impact: In Q1 2024, 7,630 TB cases were notified, with community contributing 132 cases, accounting for only 2% of the total TB case notification. After deployment of CHWs in April, 3,169 cases were diagnosed in Q2 from the community translating to a 35% contribution. Subsequently, in Q3 community contribution increased to 3,319 (44% contribution). Additionally, 8157 pregnant women were tested for HIV & Syphilis, with 10 testing positives for HIV and 151 tested positives for syphilis.



Conclusions: Results bespeak a consistent rise across quarters underscoring the crucial role of CHWs in strengthening community-based TB/HIV systems. This integrated approach has shown the possibility of providing multiple services in a one stop shop manner giving the clients increased accessibility to healthcare services within their communities. We recommend a multisectoral approach across different disease entities at community level for broader health Impact.

EP25-941-19 Detecting missed tuberculosis cases at health facilities in Ethiopia Using WRD test

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Background and challenges to implementation: Ethiopia's National Strategic Plan (2023–2030) aims to achieve the SDG set for tuberculosis (TB) by addressing the gaps in patient pathway, preventing infection, and integrating equitable healthcare. Integrating TB case finding in all service outlets is one of the initiatives in the plan. This study aims to detect missed tuberculosis cases through intensified case finding at health facilities using the WRD test.
Intervention or response: A facility-based prospective cross-sectional study conducted in 90 high-loaded health facilities across all regions of the country from July 1, 2024 to December 31, 2024, Data collection tools were developed to track the cascade of care, from case finding to treatment initiation, and health workers received training at service outlets. The Kobo tool was used for monthly data collection.

Results/Impact: During the six-month cross-sectional period, approximately 87% of outpatient clients were assessed and screened for tuberculosis (TB) using mWRD, resulting in the detection of 1,297 TB cases—equivalent to a case notification rate of 345 per 100,000 populations. Notably, certain outpatient departments (OPDs) were disproportionately affected, such as the chronic care OPD, with a notification rate of 448 per 100,000 population, and newly enrolled people living with HIV, with a rate of 2,917 per 100,000 populations.
Additionally, among contacts of bacteriologically confirmed pulmonary TB (BCPTB) cases, 30 new TB cases were detected, with a notification rate of 1,634 per 100,000 populations

Type of OPD	Total population	Number screened (#/%)	Presumptive TB (#/%)	TB diagnosed (#/%)	Case notification rate CNR/100K
Adult OPD	356,280	312,537 (88)	14,316	1,065	341
chronic OPD	23,513	19,196 (82)	828	86	448
under 5 years OPD	49,063	40,770 (83)	3,035	70	172
PLHIV newly enrolled in Care	1,599	1,577 (99)	122	46	2,917
Contacts of BCPTB case	1.877	1,836	200	30	1,634
Summary	432,332	375,916 (87)	18,501	1,297	345

Table 1: Number & proportion of TB cases detected among different categories of OPDs, July 1, 2024 to December 31, 2024.

Conclusions: Intensified case finding using mWRD effectively identified missed TB cases, especially among high-risk groups. Targeted screening and contact tracing are key to improving early TB detection and control.

EP25-942-19 Fostering sustainable facility-based active TB screening through human resource for health strengthening: TB LON project experience in three southern states of Nigeria

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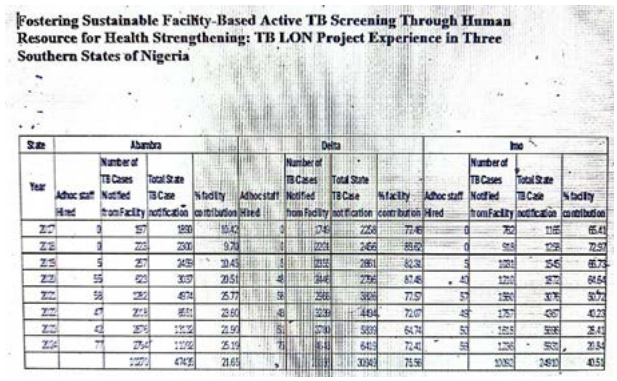
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health concern in Nigeria, requiring innovative and sustainable strategies for detection and management. Efficient Human Resources for Health (HRH) is a critical determinant to effective TB screening, to enhance TB case finding. However, the shortage and workload of the frontline health-

care workers (HCWs) pose challenges to the coverage and quality of active TB screening in health facilities. The TB Surge intervention under the USAID-funded LON 2 project aimed to engage, train, supervise and monitor personnel to expand facility coverage and improve knowledge and skills to promote TB case findings in both public and private health facilities. This study examines the outcome of HRH interventions on TB case notifications from 2017 to 2024 in the 3 southern states

Intervention or response: A retrospective analysis of TB notification data from Anambra, Delta, and Imo was conducted. Key indicators analyzed included the number of ad hoc staff hired, TB cases notified from facilities, total state TB notifications, and the percentage contribution of facilities

Results/Impact: A significant increase in TB case notifications from 197 cases in 2017 to 2,794 cases in 2024 was observed in Anambra , and the facility contribution rose from 10.42% to 25.19%. Delta consistently recorded the highest facility contribution, and the TB notifications increased from 1,749 in 2017 to 4,648 cases in 2024, with a stable facility contribution above 70%. Imo showed a decline in facility contribution from 65.41% in 2017 to 20.84% in 2024, despite an increase in absolute cases notified. Overall, the number of facility-notified TB cases in all states increased significantly.



Fostering Sustainable Facility-Based Active TB Screening Through Human Resource for Health Strengthening: TB LON Project Experience in Three Southern States of Nigeria

State	Anambra				Delta				Imo			
Year	Adhoc staff Hired	Number of TB Cases Notified from Facility	Total State TB Case notification	% facility contribution	Adhoc staff Hired	Number of TB Cases Notified from Facility	Total State TB Case notification	% facility contribution	Adhoc staff Hired	Number of TB Cases Notified from Facility	Total State TB Case notification	% facility contribution
2017	0	197	1890	10.42	0	1749	2258	77.46	0	762	1165	65.41
2018	0	203	2300	9.78	0	2201	2466	89.62	0	918	1259	72.97
2019	5	357	2459	20.43	0	2332	2861	82.38	5	1201	1545	85.73
2020	55	625	3057	20.51	48	3946	2756	87.48	43	1220	1572	84.64
2021	58	1262	4974	25.77	58	2566	3656	77.57	57	1561	3078	50.72
2022	47	2018	8651	23.66	48	3239	4494	72.07	48	1757	4367	40.23
2023	42	2575	11232	21.99	51	3740	5699	64.74	53	1818	5696	26.42
2024	77	2794	11092	25.19	73	4648	6449	72.42	58	1726	5521	20.84
			47423	21.65			30342	75.56		10382	24913	40.53

Conclusions: The findings highlight the positive impact of HRH strengthening on TB case notification. However, Imo state experienced a decline in facility contributions despite an increase in absolute cases notified. This suggests that additional contextual factors, such as infrastructure and social security, may influence outcomes.

EP25-943-19 Interim findings from community-wide screening to treat TB disease and infection in a high prevalence MDR-TB setting in Papua New Guinea

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Background: Daru island in PNG has a very high incidence of tuberculosis (TB) and multidrug-resistant (MDR/RR) TB that has persisted despite high treatment success rates. A comprehensive community-wide TB detection initiative (SWEEP-TB) was implemented from 2023 aiming to reduce incidence.

Design/Methods: Following engagement and partnership with the community in Daru (population 22,548) and public health program, a community-wide house-to-house approach utilized symptom screening and mobile CXR/AI (CAD4TB) for all resident adults and adolescents ≥10 years with Xpert Ultra to detect TB disease and link to treatment. People aged 5-34 years without TB disease (confirmed or clinical) were offered a tuberculin skin test (TST) and if positive, a novel TB preventive therapy regimen of daily isoniazid and levofloxacin for six months (6HLfx). Treatment support for disease and infection with monitoring for adverse events was provided in the community.

Results: By end of March 2025, 12,204 (54.1%) Daru residents had been screened, of whom 1,540 (12.6%) had presumptive TB with symptoms and/or CAD4TB score ≥40. Of these, 171 (11.1%) were diagnosed (135; 79% bacteriologically confirmed TB and 36 clinically diagnosed); resulting in a screening yield of 1.4%. Of 171 (including 35 MDR/RR TB) diagnosed, 150 (87.7%) initiated treatment. Of 7,172 people 5-34 years without TB, TST was performed in 6,277 (87.5%), 2,367 (37.7%) were positive, 2,327 (98.3%) were eligible for TPT and 1,750 (75.2%) were initiated on TPT. Interim analysis has found that 6LfxH has been well tolerated overall with 330 individuals report grade 1/2 side effects. Whilst the intervention had good uptake, multiple operational and health system challenges hindered the pace of screening.

Conclusions: Community-based screening and prevention in a remote setting in PNG was acceptable and feasible with high case detection yield and uptake of novel

TPT. This was due to strong community engagement and quality improvement approaches that incorporated learning to overcome barriers.

EP25-944-19 A retrospective analysis of screening activities from 2019 to 2023 in Pakistan: What more needs to be done!

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Background: Although resource and labor intensive, Active case finding (ACF) is crucial for identifying TB cases missed by routine surveillance in Pakistan. We conducted a retrospective analysis of ACF data from 2019-23 to look at its effectiveness and impact in reducing the TB burden in Pakistan.
Design/Methods: Systematic screening for TB through community chest camps is being implemented by Mercy Corps along with the National TB Program in Pakistan. A fleet of 40 vans conduct mobile chest X-ray units using CAD software and Xpert MTB/RIF for accurate TB diagnosis. Each camp operation (screening activity) is supported by a doctor, a medical imaging technician and a laboratory technician supported by District Field Supervisors (DFS) and community volunteers. All data collected is entered in a database in real time.
Results: A total of 485,237 individuals were screened in 7,789 camps from 2019 – 2023 conducted in 93 districts across Pakistan. With an overall TB+ yield of 37 per 1000 screened, we identified 18,100 individuals with TB (42.3% B+ vs 57.7% clinically diagnosed). Nearly 44.5% camps did not detect any B+, whereas 31.7% of camps identified only one B+ case. Of the 149,500 missing cases in 2023, chest camps were able to find 8,319 TB cases and reduced the missing gap only by 5.6%.
Conclusions: This study provides the largest dataset on mobile X-ray-based ACF. Significant variability in detection rates was observed, driven largely by geographic factors. Given limited resources, ACF strategies should be assessed for their incremental yield in detection and cost-effectiveness. Without a targeted approach using localized prevalence data, general ACF efforts yield low TB detection rates and are impractical in resource-poor countries. Improved screening and diagnostic methods are essential to reduce empirical treatment rates and ensure more accurate care.

EP26 Finding the missing millions: A focus on key populations

EP26-946-19 An experience from Pakistan under a multi-country TB grant; TB and MDR-TB interventions among Afghan refugees, returnees, and mobile populations in Afghanistan, Iran, and Pakistan

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Background and challenges to implementation: Afghanistan has one of the highest numbers of refugees in South East-Asia. Pakistan is hosting one of the largest populations of Afghan refugees since 1979, around 4 million are living in Pakistan in the refugee camps. The burden of Tuberculosis (TB) is presumed to be higher in the refugee camps with a significant number of undetected cases. To address this, The UNDP Afghanistan, as Principal-recipient of the Global Fund implemented the Project of Multi-Country Grant (MCG) in Iran, Afghanistan and Pakistan with the aim of finding and treating TB cases among Afghan refugees. In Pakistan, NTP, Pakistan implemented the MCG as a sub-recipient of UNDP Afghanistan during 2019-24.
Intervention or response: This study evaluates the Active Case Finding (ACF) intervention implemented by NTP Pakistan under the MCG, including treatment outcomes. ACF being implemented in 45 refugee camps in Khyber Pakhtunkhwa and Baluchistan Provinces, Pakistan, by trained Field staff, through symptom screenings and contact tracing. Presumptive TB cases identified were referred to the nearest TB facility for diagnosis, and confirmed cases were registered for treatment with regular follow-up.
Results/Impact: Out of 560,000 individuals screened, 53,995 (10%) identified as presumptive TB cases, with 4,860 (9%) confirmed TB cases. Among them, 52% were female, 76% pulmonary and among pulmonary, 62% were bacteriologically confirmed. The Number Needed to Screen to identify to one TB patients among presumptive cases was 11.
Unfavorable treatment outcomes were lower in ACF cases (3%) compared to routine cases (6%) ($P < 0.05$). Among bacteriologically confirmed cases, there was a higher contribution of cure to treatment success in the ACF group (86.5%) compared to routine cases (69%).
Conclusions: The ACF strategy is useful and have additional benefits such as contribution to early case finding and detection of patients from the refugee camps, with an extended benefit for reducing secondary cases in the community.

EP26-947-19 A strategic active case finding approach to maximize coverage among working men population, Madurai, Tamil Nadu-India

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Background and challenges to implementation: Globally, Tuberculosis (TB) is more common in men than women. In 2023, an estimated 6.0 million men fell ill with TB, compared to 3.6 million women. Considering the fact that 70% of TB is diagnosed among men in Madurai district of Tamil Nadu (TN) and 80% of these men were in the working age group (25-65 years). Reaching this population during routine daytime Active Case Finding (ACF) camps was difficult, therefore a time-adaptive evening camp approach was considered.
Intervention or response: In the State of TN, India, for 'ACF Camp' Mobile Vans fitted with Digital X-Rays are used for Community screening. Plans were drawn to conduct screening between 17:00 and 21:00 hours to cover the working male population among daily wage laborers living in urban slums and evening markets through community mobilization and advocacy. 12 health care workers per camp were involved and incentivized for working extra hours during the evenings.
Results/Impact: A total of 65 Moonlight TB Camps were conducted from December 2024 to February 2025, where 2,141 chest x-rays offered after screening, 266 sputum samples were transported for upfront rapid molecular tests and 22 (17 men & 5 women) were diagnosed with TB, of which 13 PwTB were bacteriologically confirmed. Whereas, the daytime routine ACF during the same period had 61 Camps, 2958 chest x-rays taken after screening, 296 sputum samples transported for upfront rapid molecular tests and 12 (10 men & 2 women) diagnosed with TB, of which 10 PwTB were bacteriologically confirmed.
Conclusions: The evening camps helped to screen the working male population who would otherwise be missed during daytime ACF camps. This innovative time adaptive method demonstrates the importance of tailoring healthcare delivery to the schedules and needs of specific populations, and has also yielded higher case finding as compared to conventional ACF screening camps.

EP26-948-19 Enhancing tuberculosis detection in elderly general population using Rapid qPCR tongue swabs for active case finding during routine physical examinations in low burden city

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Background: Tuberculosis (TB) remains a major cause of infectious disease mortality worldwide, and diagnosis remains challenging. The utilization of Rapid quantitative PCR (qPCR) on tongue swab presents a convenient approach for TB active case finding.
This study aimed to estimate the cost-effectiveness of tongue swab testing in combination with routine chest radiograph (CXR) physical examination among elder general population in six districts of Shanghai, a low-burden city of TB in China, to optimize TB case detection.
Design/Methods: This prospective study enrolled 42,731 elderly participants undergoing routine CXR l examinations across six Shanghai districts. Tongue swab specimens were collected, and the individuals with positive tongue swab results were conducted systematic evaluations by composite microbiological reference standard (MRS), which included sputum smear, culture and Xpert MTB/RIF.
Results: Among 42,731 participants, the median age was 71.0 years. Positive tongue swab testing was observed in 9 and was asymptomatic in 4/9 (44.4%). Microbiologically diagnosed TB occurred in 7 (7/9, 77.8%) with 57.1% (4/7) being asymptomatic. The additional cost of tongue swab screening per TB case detected was $24,958.06, which is slightly lower than Shanghai's per capita gross domestic product (GDP) of $25,896.5.
Conclusions: Approximately half of microbiologically diagnosed TB cases in the elderly population were asymptomatic, underscoring the critical need for active case finding. Tongue swab screening detected 77.8% of TB cases at a cost of $24,958.06 per case, given its cost-effectiveness relative to the local GDP.
Extrapolating our findings, we observed five and two microbiologically diagnosed TB cases in two specific districts, corresponding to incidence rates of 29.15 (95%CI 10.7–72.3) and 14.99 (95%CI 2.6–60.5) per 100,000 population, suggesting that the true burden of TB in these areas may be underestimated.

The potential of tongue swab screening in economically developed, low-burden settings, particularly among asymptomatic elderly populations, remains to be further explored for broader implementation.

EP26-949-19 Active tuberculosis screening and case finding within informal drinking establishments and drug abuse dens in Githurai, Nairobi County, Kenya

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Background and challenges to implementation: Alcohol use disorder is the 3rd risk factor attributed to TB cases in Kenya (WHO Report 2024) after HIV and undernutrition. The use of drugs and excessive consumption of alcohol damage a person's organs and weaken their immune system increasing susceptibility to tuberculosis. Furthermore, they may not access adequate food and mostly spend time in crowded or poorly ventilated homes or social venues (NACADA/CHS Report 2022). In 2024, Nairobi notified 929 cases among this key population, contributing to 6.7% of the total TB cases. This was an increase from 5.6% (751) notified in 2023.
Intervention or response: In March 2025, Nairobi County conducted a five-day TB screening in drinking and substance abuse dens in Githurai. Community health promoters sensitized the population living within the dens on TB and mobilized them to visit designated TB screening center. Health education and counseling were provided, those who provided consent underwent an initial digital chest X-ray. Individuals with abnormal chest X-ray results were subsequently evaluated by clinicians and referred for GeneXpert testing.
Results/Impact: A total of 218 were reached with tuberculosis messages, consisting of 85% (151) males and 15% (67) females. About 86% (188) of clients were screened using digital X-ray of which 72% (132/188) were males. Of those screened, 13% (24/188) had abnormal x-ray findings with a score of ≥ 50 and were subjected to GeneXpert test. Additionally, 83% (180) had respiratory symptoms and were further evaluated for TB by the clinicians. In total, 23 TB cases were diagnosed (14 bacteriologically and 9 clinically diagnosed). The burden was higher in males (17 cases) than females (6).
Conclusions: This study emphasizes the importance of developing TB case-finding strategies specifically designed for individuals who engage in alcohol and substance use. This group, often stigmatized and hard to reach, faces significant barriers to accessing care, linkage to care, and treatment adherence.

EP26-950-19 Yield of targeted universal TB testing strategy among people living with HIV in Zimbabwe

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Background: The use of symptom-based TB screening misses almost 15% of TB clients with untreated HIV and up to 50% of TB clients among those on antiretroviral therapy. Targeted universal TB testing (TUTT) strategy adds chest X-ray (CXR), lateral flow urine lipoarabinomannan assay (LF-LAM), and rapid molecular tests to the screening algorithm among high-risk populations at least once per year. We assessed the increase in TB case finding following the implementation of the TUTT strategy among people living with HIV (PLHIV) in Zimbabwe.
Background and challenges to implementation: The use of symptom-based TB screening misses almost 15% of TB clients with untreated HIV and up to 50% of TB clients among those on antiretroviral therapy. Targeted universal TB testing (TUTT) strategy adds chest X-ray (CXR), lateral flow urine lipoarabinomannan assay (LF-LAM), and rapid molecular tests to the screening algorithm among high-risk populations at least once per year. We assessed the increase in TB case finding following the implementation of the TUTT strategy among people living with HIV (PLHIV) in Zimbabwe.
Intervention or response: TUTT was implemented in district- and primary-level facilities. During March-September 2024, all PLHIV seeking care at selected facilities were screened for symptoms and referred for CXR, Xpert® MTB/RIF assay (Xpert), and LF-LAM, regardless of symptoms. We used descriptive statistics to report the number of symptomatic and asymptomatic clients among all TB diagnoses.
Results/Impact: Among 14,960 clients who visited selected facilities at least once during the implementation period, 13,688 received the TUTT strategy; 199 (1.3%) were diagnosed with TB. Among them 73 (36.7%) did not report TB symptoms. Majority (64, 87.7%) of asymptomatic client were diagnosed using Xpert and 4 (5.5%) by LF-LAM; 5 (6.8%) were clinically diagnosed according to TB-suggestive CXR. Among 126 (63.3%) symptomatic TB clients, 82 (65.1%) were bacteriologically confirmed by Xpert and 21 (16.7%) by LF-LAM; 23 (18.3%) were clinically diagnosed based on TB symptoms and CXR results. Of 199 TB clients, 196 (98.5%) started TB treatment, 3 (1.5%) were lost to follow-up or transferred out.

Conclusions: More than a third of PLHIV diagnosed with TB during the project did not have TB symptoms and were only found through the TUTT strategy. The use of additional tools for routine TB screening and testing among PLHIV can help increase TB case finding and reduce TB transmission in the country.

EP26-951-19 Point-of-care C-reactive protein testing for tuberculosis screening among people living with HIV: A feasibility study in Uganda

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Background: Tuberculosis (TB) remains a leading cause of mortality among people living with HIV (PLHIV). The World Health Organization four-symptom screen (WHO 4SS) has low sensitivity, which can lead to missed opportunities for early detection of TB. To address this gap, the WHO recommends using a C-reactive protein (CRP) test as a screening tool for TB in PLHIV.
This study evaluated the feasibility of implementing CRP testing in Uganda.
Design/Methods: A cross-sectional study was conducted from April to June 2023 at 50 health facilities, during which healthcare workers screened for TB among PLHIV above 10 years using POC CRP, and the WHO 4SS. Focus group interviews were held with healthcare workers at all facilities to ascertain key feasibility indicators such as acceptability, usability, the costs , equipment and data management.
Results: Out of 50 facilities, 32 had 100% access to CRP testing for eligible people with PLHIV. However, the remaining facilities faced challenges due to intermittent equipment breakdowns, adoption challenges, and knowledge gaps in new TB screening policies and guidelines. Among healthcare workers, 98% reported that they found the POC CRP test procedures easy to use and felt comfortable recommending the test to other facilities. The turnaround time for results and the cost of the tests were three times lower than those of conventional CRP equipment. Connectivity was a significant challenge, with 16 facilities reporting internet-related barriers that affected CRP data interoperability.
Conclusions: The study showed that POC CRP testing is a feasible method of TB screening among PLHIV in Uganda. However, to ensure the successful implementation of CRP testing, it is essential to invest adequately in CRP commodities, equipment management, data connectivity, continuous training, mentorships, and technical support supervision activities.

EP26-952-19 Field performance evaluation of the point of care afinion C-reactive protein for TB screening in people living with HIV in Uganda

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Background: Tuberculosis (TB) remains a leading cause of mortality among people living with HIV (PLHIV), yet current screening tools such as the WHO 4-symptom screen (WHO 4SS) have suboptimal sensitivity. C-reactive protein (CRP) is emerging as a potential biomarker for TB screening. This study evaluated the performance of CRP for TB screening among people living with HIV (PLHIV) in programmatic settings in Uganda.
Design/Methods: A cross-sectional study was conducted across 50 health facilities in Uganda, enrolling 12,449 PLHIV above 10 years. CRP levels were measured using a cut-off of >5 mg/L. We compared the performance of CRP to WHO 4SS using sensitivity, specificity, receiver operating characteristic (ROC) analysis, and the number of PLHIV needed to screen (NNS) using each tool in order to yield one TB case. PLHIV with a CRP 5mg/L and or a positive WHO 4SS were subjected to a sputum GeneXpert test which was used as a gold standard for TB diagnosis.
Results: Out of 12,449 eligible participants, 66.8% were female, 83.1% were aged 30 years and above, and about 20% had CD4 counts <200 cells/mm^3. CRP demonstrated higher sensitivity (50.4%) and specificity (71.8%) compared to WHO 4SS (38.3% sensitivity, 68.9% specificity) and had a better area under the curve (0.61 vs. 0.54). The number of PLHIV needed to screen (NNS) to identify one TB case using CRP >5 mg/L was 8.8 Vs. 7.8 (WHO 4SS). CRP performed better among males (63.4% Sensitivity, 70.3% specificity) and in PLHIV with CD4 <200 cells/mm^3 (SE = 49.5%, SP = 71.8%). Thirty-two additional TB cases were identified using CRP that WHO 4SS would have missed.
Conclusions: CRP-based TB screening demonstrates improved sensitivity and specificity over WHO 4SS, particularly among high-risk subpopulations. Integrating CRP into routine TB screening for PLHIV may enhance early TB detection and contribute to reduced mortality.

EP26-953-19 Peak tuberculosis transmission at 24 weeks post-exposure with BCG-driven risk reduction in household contacts

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Background: Household contacts of active tuberculosis (TB) patients face elevated infection risks, yet optimal screening intervals remain undefined. This study aimed to characterize TB infection dynamics and identify key risk factors among close contacts using interferon-γ release assays (IGRA).
Design/Methods: We conducted a 12-month prospective cohort study of 229 household contacts from 107 culture-confirmed pulmonary TB cases. Participants underwent serial IGRA testing at enrollment and regular intervals. Multivariate logistic regression analyzed demographic, clinical, and exposure-related risk factors for IGRA conversion.
Results: The cumulative IGRA conversion rate was 52.0% (119/229), with 99.2% (118/119) of conversions occurring within 24 weeks post-exposure. Significant independent risk factors included: age (aOR=1.8 per decade, p<0.01), comorbidities (OR=2.3, p=0.003), shared residence (OR=2.1, p=0.02), and index case bacterial load (OR=3.5, p<0.001). BCG vaccination demonstrated 40% protection against infection (OR=0.6, p=0.04).
Conclusions: TB transmission predominantly occurs within 24 weeks of exposure, suggesting this as the critical window for detection. Our findings support: (1) targeted IGRA retesting at 24 weeks for exposed contacts, particularly those with identified risk factors; and (2) continued BCG vaccination in TB control programs. This approach offers an efficient strategy for early detection and prevention in high-burden settings.

EP26-954-19 Acceptability of education materials for training and collection of tongue swabs for tuberculosis screening in migrant settings: A qualitative study

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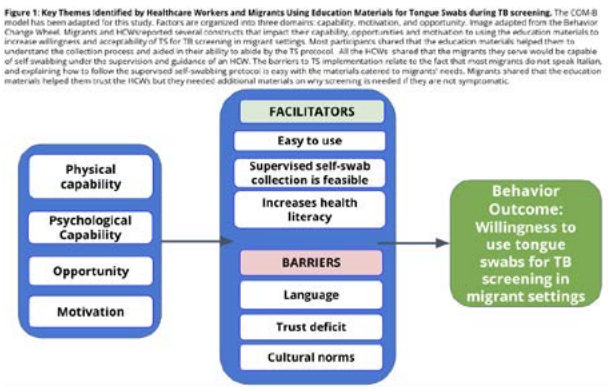
Background: TB screening is challenging among migrant populations because of a reliance on sputum-based testing and the migrants' hesitation to seek healthcare. This study evaluates the feasibility and acceptability of targeted educational materials to guide migrants and healthcare workers (HCWs) in a non-sputum option, supervised tongue swabs (SSS) for TB screening. TS is up to 95% sensitive when swab-specific laboratory analytical methods are used. To scale TS for screening and population health, users should be able to swab themselves effectively. This is the first study to evaluate targeted educational materials for SSS.
Design/Methods: This user experience study uses in-depth interviews and purposive sampling of migrants and HCWs experiencing and conducting TB screening in Milan, Italy. Recruitment began in March 2024 and will continue until saturation among themes is reached. Hamilton's Rapid Qualitative Analysis Method was adapted to summarize key findings.
Results: Results reveal participants' perceptions of illustrations and videos to teach how to collect a valid provider- or self-collected sample. All the participants reported that the video was the best option, but it needed audio narration in the migrants' primary language. All HCWs shared that the videos and illustrations guided the migrants to swab effectively. HCWs shared the need for accessibility of the illustrations to be shared on their websites and social media. Many migrants shared that they want videos to explain the impacts of TB and why screening is important. The majority of the migrants shared that this was the first time that anyone had asked them what they thought and what would make it easier, and that made them feel seen and increased their willingness to participate.



Conclusions: Illustrations and videos are acceptable to both migrants and HCWs. There is a need for TS educational materials and health promotion campaigns that HCWs can use to tailor care to migrants' needs.

EP27 Cracking the code on TB surveillance

EP27-955-19 Long-term sub-national trends in tuberculosis case notification in Kiribati

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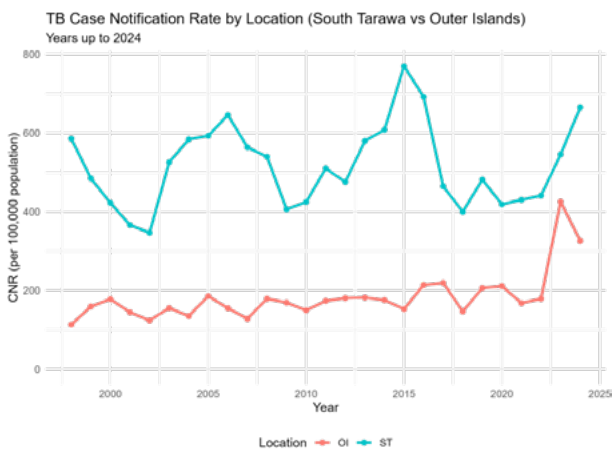
Background and challenges to implementation: Kiribati continues to face one of the highest tuberculosis (TB) burdens globally. National data often obscure geographic variation, particularly between the densely populated capital, South Tarawa, and the remote outer islands. To date, no subnational analysis of TB epidemiology from Kiribati has been published or presented internationally.
Intervention or response: We reviewed routinely collected TB programme data over a 26-year period (1998 to 2024). Annual case notification rates (CNRs) were compared between South Tarawa and the outer islands. We analysed long-term trends in TB notifications and disaggregated data by age, sex, and TB disease type.
Results/Impact:
TB CNRs in South Tarawa were consistently 2–3 times higher than in the outer islands, with a peak of 770 per 100,000 in 2015 and rate of 665 per 100,000 in 2024. It is notable that South Tarawa experienced notification peaks during periods of intensified active TB case finding. The male:female gender ratio was 53:47 (similar in South Tarawa and outer islands), with the greatest proportion of cases (38%) detected in the 10-29 years age categories. Children aged 0-9 years comprised an increasing proportion of notified cases, particularly in South Tarawa (26% in 2024), indicative of uncontrolled community transmission and an increased focus on paediatric TB. The proportion of pulmonary TB notifications rose sharply in 2018, following the introduction of first-line sputum Xpert testing.



Conclusions: This is the first longitudinal subnational assessment of TB epidemiology in Kiribati. The findings emphasise the importance of geographically disaggregated surveillance to guide targeted responses. Reducing TB transmission in South Tarawa, while maintaining equity and access in remote outer islands, is essential to achieve national TB control goals. Key lessons also apply to other small island states with dispersed populations.

EP27-956-19 Digitization of tuberculosis data through a quality improvement approach: Electronic case-based TB surveillance system at 155 health facilities in Uganda

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Background and challenges to implementation: In 2020, the Ugandan Ministry of Health, supported by partners, introduced the Electronic Case-Based TB Surveillance System (eCBSS) to improve TB and leprosy patient management, reporting, and surveillance. By December 2023, eCBSS was implemented in 155 health facilities in the Bugisu and Bukedi regions, but only 23% of facilities reported TB cases in real-time. To address this gap, quality improvement (QI) strategies were employed.
Intervention or response: A root cause analysis in January 2024 identified barriers including undefined roles for data teams, limited internet access, poor data triangulation with Health Management Information System (HMIS) reports, and data backlogs. The Quality Improvement (QI) strategies implemented included:
- Defining data team roles and setting daily entry targets.
- Providing 7.5GB internet bundles per facility.
- Creating a communication directory of trained personnel.
- Sending weekly reminders via SMS, email, and WhatsApp.
- Assigning two eCBSS mentors per district for support and follow-up.
- Deploying extra human resources to clear backlogs in high-burden facilities.

Results/Impact: By June 2024, 96% of TB cases from weekly HMIS reports were entered into eCBSS in real-time. This improved the system's ability to notify drug-susceptible TB patients, with 1,124 patients notified in real-time.
Conclusions: QI innovations improved real-time TB reporting across 155 health facilities. These digital enhancements, coupled with a quality improvement approach, strengthened TB control efforts and decision-making.

EP27-957-19 Addressing the missing millions: A digital health and community-led approach to TB detection in India

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Background and challenges to implementation: India's vast population, diverse geography, and persistent TB-related stigma hinder effective TB control. The "Missing Millions" refers to undiagnosed or unreported cases, especially in rural areas, where stigma and exclusion prevent individuals from seeking care. Despite progress under the National TB Elimination Program (NTEP), detection remains challenging in rural Tamil Nadu due to stigma, exclusion, and geographic barriers.
Intervention or response: To address these challenges, Blossom Trust implemented OneImpact India, a digital health platform developed with STOP TB and Dure Technologies. Based on Community-Led Monitoring (CLM) and the Availability, Accessibility, Acceptability, and Quality (AAAQ) framework, the app provides a confidential, stigma-free space for individuals to access TB-related information, report symptoms or side effects, and raise care and treatment challenges. Tailored to rural Tamil Nadu's needs, the app addresses local barriers such as geographic isolation and fear of discrimination. From January to June 2024, it was rolled out across four districts: Madurai, Virudhunagar, Thoothukudi, and Theni.
Results/Impact: The app engaged 2,189 users who reported 2,078 TB-related challenges, including fear of testing and difficulty accessing services; 102 of these were resolved. A user survey (n=655) revealed the following:
- 66.2% gained improved knowledge of TB
- 54.5% learned about local treatment centres
- 33.9% discovered testing locations
- 34.6% identified medicine access points
- 39.1% understood treatment follow-up
- 95.5% found the app easy for reporting symptoms or side effects

The evidence shows that the app not only improves patient engagement but also enhances treatment adherence, a critical factor in reducing TB transmission.
Conclusions: OneImpact India demonstrates how digital tools can bridge gaps in TB care by empowering communities, improving awareness, and strengthening healthcare connections. While challenges remain, including digital literacy and technical stability, continued optimisation and integration of the app can offer a scalable, sustainable solution with the potential to ensure no one is left behind in eliminating TB.

EP27-958-19 Healthcare-related factors associated with the rate of missing tuberculosis cases: A subregional ecological analysis in Indonesia

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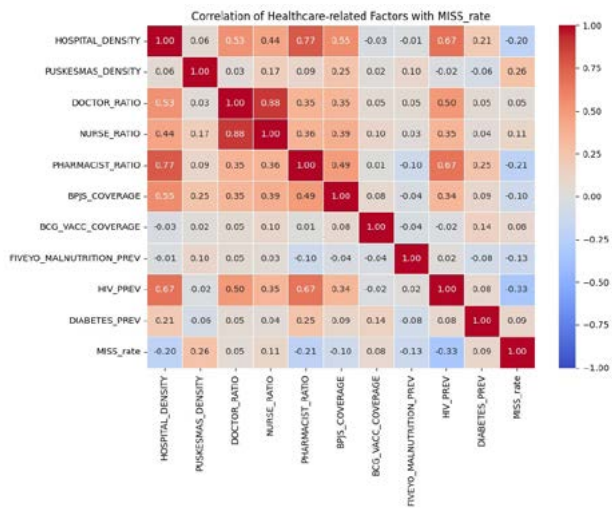
Background: Healthcare-related factors may significantly influence efforts to identify individuals with tuberculosis (TB), as reflected in the rate of missing cases. These diagnostic gaps contribute to delays in treatment initiation and ongoing transmission. This study analyzes the relationship between healthcare-related factors and the rate of missing TB cases across eight provinces with the highest TB burden in Indonesia.
Design/Methods: This ecological analysis utilized secondary data from the Indonesian National TB Programme, provincial health profiles, and the Central Statistical Bureau. Multiple linear regression and spatial analysis across Java, North Sumatra, South Sumatra, and South Sulawesi were employed to evaluate associations between healthcare-related indicators and the rate of missing TB cases at the subregional level.



Results: The prevalence of HIV (r=–0.33) showed the strongest correlation with the missing case rate, followed by the primary health center (PHC) ratio per population (r=0.26), pharmacist ratio (r=–0.21), and hospital ratio (r=–0.20). HIV prevalence (coefficient=–636.67; 95%CI: –974.67 to –298.69; p<0.001), PHC ratio (0.0512; 95%CI: 0.029 to 0.074; p<0.001), malnutrition prevalence (–8.25;

95%CI: –14.78 to –1.71; p=0.014), and diabetes prevalence (2.88; 95%CI: 0.25 to 5.51; p=0.032) were independently associated with the missing case rate. Spatially, several factors were regionally-specifically correlated with missing case rate, such as HIV and diabetes prevalence in North Sumatra (p<0.001) and PHC ratio, malnutrition and HIV prevalence in Java (p<0.05).
Conclusions: Healthcare system indicators—including PHC facility density and prevalence of HIV, malnutrition, and diabetes—were significantly associated with the rate of missing TB cases at the subregional level. These findings highlight the need for context-specific healthcare strategies to improve TB identification and reduce diagnostic gaps.

EP27-959-19 Characteristics of TB cases and clustering of TB risk factors: An analysis in the ERASE-TB study

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Background: Risk factors such as HIV, smoking, alcohol use and malnutrition contribute significantly to TB burden. These risk factors may cluster in individuals and their prevalence differs by gender. We aimed to investigate the prevalence, clustering and population attributable fractions (PAFs) of TB risk factors, stratified by gender, in three high-TB/HIV burden, southern African countries.
Design/Methods: This was a cross-sectional study of adults with highly-infectious pulmonary TB in Harare, Zimbabwe; Maputo, Mozambique; and Mbeya, Tanzania (2021–2022). Risk factors were determined through a self-reported questionnaire. Prevalence and 95% confidence intervals (95%CI) were calculated stratified by gender and country. PAFs were calculated using published risk estimates and observed prevalences.
Results: Of 905 participants, 619 were men (68%). Median age was 28 (interquartile range 25–32) years. Prevalence of HIV, smoking, alcohol use, self-reported known diabetes was 30% (95%CI: 27-33%), 36% (95%CI: 32-39%), 16% (95%CI: 13-19%) and 2.3% (95%CI: 1-4%) respectively and differed by gender (Table). Half (95%CI 47-53%) of participants had more than one risk factor. Clustering of risk factors was more common in men than women (prevalence of >1 risk factor: 57% vs 35%). The most common risk factor combinations were HIV-smoking and alcohol-smoking. Smoking had the highest PAF among men across all countries (20%–36%) followed by HIV (15%–18%). Importantly the estimated PAF for smoking was much higher than the World Health Organisation (WHO) estimates. Among women, HIV had the highest PAF across all countries (16%–25%) while the PAF for smoking was relatively low (2.1%–4.9%).

	Risk factor	RR from literature review	Male TB prevalence (ERASE TB study)	Female TB prevalence (ERASE TB study)	PAF (Pc (RR-1/RR) Male	PAF (Pc (RR-1/RR) Female
Zimbabwe	Smoking	2.32	63.6%	8.6%	36.2%	4.9%
	Alcohol abuse	1.43	41.6%	13.3%	12.5%	4.0%
	HIV	2.49	30.6%	41.0%	18.3%	24.5%
Mozambique	Smoking	2.32	35.9%	3.9%	20.4%	2.2%
	Alcohol abuse	1.49	4.4%	2.0%	1.3%	0.6%
	HIV	2.49	30.4%	31.4%	18.2%	18.8%
Tanzania	Smoking	2.32	48.2%	3.8%	27.4%	2.1%
	Alcohol abuse	1.43	12.4%	6.3%	3.7%	1.9%
	HIV	2.49	25.7%	26.6%	15.4%	15.9%

Table1: Prevalence of risk factors by country and sex

Conclusions: Prevalence and clustering of TB risk factors differ by gender, however WHO PAF estimates do not account for gender differences. Our findings highlight the need for tailored prevention and control strategies which take gender into account.

EP27-960-19 Long-term transmission dynamics and phylogeography of *Mycobacterium tuberculosis* in an emerging city in China: A population-based phylodynamic analysis

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Background: Shenzhen, with high population mobility, faces TB control challenges. By integrating whole-genome sequencing and phylodynamics, we explore genomic factors driving sustained MTB transmission and trace its origins and spread.

Design/Methods: Whole-genome sequencing was conducted on MTB strains collected between 2014 and 2022 from Baoan, Shenzhen, China. Bayesian modeling and phylogeographic analysis assessed the evolutionary history and transmission fitness of lineages and sublineages.

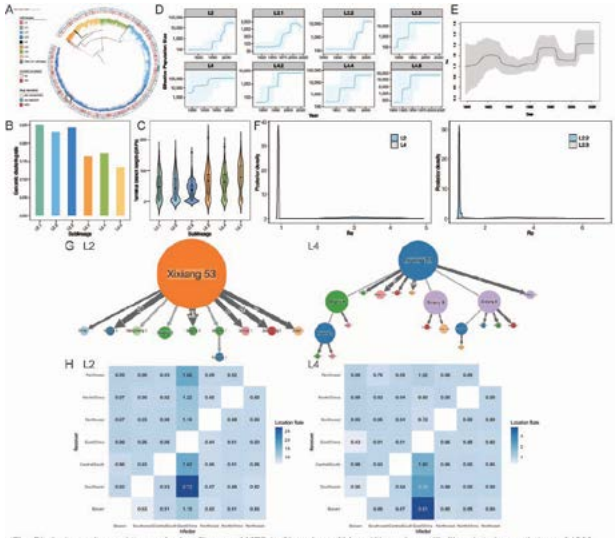

Fig. Phylodynamics and transmission fitness of MTB in Shenzhen, China. (A) maximum-likelihood phylogenetic tree of 4560 MTB isolates. (B) Comparison of genomic cluster rates between clades using 12-SNP thresholds. (C) Comparison of terminal branch length (TBL) across clades. (D) Effective population size estimates by clade. (E) Birth-death skyline plots of the effective reproductive number (*Re*) for all MTB isolates. (F) Relative transmission fitness of MTB by lineage. (G) Spatiotemporal ancestral reconstruction of L2 and L4 strains with inferred geographic spread events. (H) Heatmap of estimated interregional migration rates between L2 and L4 lineages across China.

Results: Among 4,560 MTB strains, L2 was the most prevalent lineage (73.3%), followed by L4 (25.9%). The dominant sublineage was L2.3 (49.5%), followed by L2.2 (22.1%) and L4.4 (10.9%) (Fig. A).

Sublineages L2.1 to L2.3 showed higher clustering rates and shorter TBLs than sublineages L4.2 to L4.5 ($P < 0.001$) (Fig. B, C).

Bayesian Skyline estimated that L4 had a more ancient TMRCA (1538, 95% HPD 1438-1830), with its effective population sizes (N_e) remaining stable since the 1950s, whereas L2 had a younger TMRCA (1837, 95% HPD 1773-1889) and its N_e expanded around the 2000s (Fig. D).

Birth-death Skyline revealed three phases of increase in the effective reproductive number (R_e) of MTB in Baoan, with an ongoing growth from the 2000s to the present (R_e 1.42, 95% HPD 1.23-1.67) (Fig. E).

The multitype birth-death model identified that L2 strains, especially L2.3, had significantly higher R_e than L4 and L2.2 (Fig. F).

Phylogeographic analysis suggested that L2 strains likely originated from Xixiang (CBD), while L4 strains spread from Fuyong (industrial areas) (Fig. G).

Nationwide, L2 and L4 strains from Baoan both showed the strongest connection with the East China region (Fig. H).

Conclusions: Shenzhen's TB epidemic shows sustained growth, driven mainly by L2 strains, especially L2.3. Our results emphasize the urgent need for TB control in Baoan, particularly in CBD and industrial areas.

Routine WGS surveillance will enhance understanding of TB biology and transmission and improve targeted responses.

EP27-961-19 Refining TB molecular surveillance in Taiwan: A cohort study addressing MIRU-VNTR variations with WGS validation

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Background: Compared to whole genome sequencing (WGS), Mycobacterial Interspersed Repetitive Unit-Variable Number Tandem Repeat (MIRU-VNTR) requires less specialized equipment and technical expertise and is more cost-effective. As a result, it remains the primary method for genotyping and phylogenetic analysis in many countries, particularly those with a high TB burden. However, variations in MIRU-VRNT loci can lead to inaccuracies in phylogenetic analysis.

This study systematically analyzed the factors associated with MIRU-VRNT loci variations, providing insights into their impact on strain classification and epidemiological interpretations.

Design/Methods: We performed genotyping and phylogenetic analysis of multidrug-resistant TB (MDR-TB) using MIRU-VNTR and WGS from 2017 to 2024. WGS was conducted via Illumina MiSeq, and UPGMA and MEGA 7 were used for phylogenetic inference. Single nucleotide polymorphism (SNP) thresholds of ≤5 and ≤15 were applied to define definite and probable transmission.

We further examined the relationship between MIRU-VNTR variation and strain lineage, patient characteristics (age, sex, nationality, comorbidities, drug resistance, and treatment).

Results: Of the 604 MDR-TB cases, 447 (74.0%) were male, with a median age of 61 years. Among them, 524 (86.8%) were newly diagnosed, 510 (86.8%) had pulmonary TB, and 176 (29.1%) were acid-fast bacillus (AFB) smear-positive. Based on MIRU-VNTR-defined clusters, 27 cases were reclassified after WGS-based phylogenetic analysis. WGS provided more precise genotyping and phylogenetic information, enhancing tuberculosis surveillance and outbreak tracking. In addition, this study investigated the causes of MIRU-VNTR repeat sequence variation and evaluated the influence of epidemiological factors on these changes.
Conclusions: MIRU-VNTR requires cautious interpretation, especially for transmission tracking. WGS validation is recommended for cluster confirmation. This study supports refining MIRU-VNTR protocols or incorporating additional markers to improve resolution and TB surveillance.

EP27-962-19 Distribution of *Mycobacterium tuberculosis* lineages and clades by drug profile in Ethiopia: Systematic review and meta-analysis

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Background: *Mycobacterium tuberculosis* lineages exhibit variability in geographic distribution, transmissibility and disease phenotype. Ethiopia is one of the countries with the highest prevalence of tuberculosis. However, information on the proportion of lineages and clades by drug profile and disease phenotype is limited.
Design/Methods: The results were reported by the PRISRM guidelines. The study protocol was registered with ID CRD42024498336. Studies reporting Mtb lineages and/or clades with drug resistance profiles published between March 2010 and June 2024 were included. I^2 was used to evaluate heterogeneity. A p-value of less than 0.05 and an I^2 value >75% were indicative of significant heterogeneity.
Results: A total of 5554 *Mycobacterium tuberculosis* strains were enrolled from 32 studies. Percentage of East-African-Indian was 26.8% (95% CI: 22.6-30.6), and Euro-American was 64.1% (95% CI: 59.6-68.4). In studies that only included multidrug or rifampicin resistance cases, percentage of East-African-Indian was 31.2% (95% CI: 23.5-38.9), while Euro-American was 47.1% (95% CI: 37.5-56.6). Euro-American followed by East-African-Indian was the predominant lineage across locations and type of TB; however, East-African-Indian was significantly high in the Amhara region for both pulmonary TB and extra-pulmonary TB than it was in Addis Ababa. As defined by spoligotyping, T_3ETH (28.22%), CAS1-Kili (18.13%), and T_1 (11.54%) were the three most common clades among MDR/RR TB cases, while CAS1-Delhi (20.23%), T_1(16.71%), and T_3ETH (13.50%) were the three most common clades among susceptible cases.
Conclusions: This data helps the TB program to address issues unique to a given area.

EP27-963-19 Leveraging the AIM250 ODK Vantage Solution for enhanced performance monitoring and data-driven decision-making in TB and HIV grant implementation by KNCV Nigeria

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Background and challenges to implementation: Under the Global Fund Grant Cycle 7 (GC7), KNCV Nigeria implements TB and HIV project across Akwa Ibom, Anambra, Bauchi, Cross River, Kano, Kaduna, and Katsina States. Prior to the adoption of the AIM250 ODK Vantage Solution, the project faced critical challenges including delayed data reporting, low data completeness, inconsistent performance tracking, and limited accountability at state levels. These gaps hindered timely interventions and reduced project efficiency. Addressing these challenges, KNCV Nigeria deployed the AIM250 ODK Vantage Solution across all GC7 states for effective and real-time state-level monitoring and swift corrective actions.
Intervention or response: In October 2024 7 Public-Private Mix Cluster Coordinator (PPMCC) member and 7 State Technical Officer (STO) were trained across the 7 implementing state on the use of the ODK platform for weekly and monthly reporting. Metrics tracked included compliance with reporting timelines, platform adoption rates, adherence to program protocols, and improvements in data quality (completeness and accuracy).
Results/Impact: A comparison of project performance from Quarter four 2024 to Quarter One 2025 revealed significant improvements. Data completeness increased from 62% to 90%, and reporting timeliness improved from 55% to 88%. Adherence to weekly and monthly reporting rose by 70%, while active platform adoption reached 95% across states. TB case detection improved by 33%, and HIV service linkage rates increased by 28%. These gains underscore the effectiveness of AIM250 in driving data-informed decision-making.

Conclusions: The AIM250 ODK Vantage Solution has strengthened real-time performance monitoring and accountability, enabling data-driven decisions that enhance TB and HIV program outcomes. Its scalability offers potential for nationwide application.

EP27-964-19 Transitioning to a paperless system for tuberculosis data management: Evaluating the eTB Manager in Sherpur District, Bangladesh

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Background and challenges to implementation: Tuberculosis (TB) management in Bangladesh has traditionally relied on paper-based systems for patient data entry, which can be time-consuming, prone to errors, and difficult to scale. In recent years, the eTB-Manager application has been introduced to digitize TB data management, enhancing data accuracy, accessibility, and operational efficiency. Initially, both paper and digital systems were maintained to ensure data validation.

This ongoing pilot study in Sherpur district of Bangladesh aims to evaluate the feasibility and effectiveness of fully transitioning to the eTB-Manager, eliminating paper-based recording entirely.

Intervention or response: In December 2024, devices and training were provided to participants, and piloting began in January 2025. A structured survey was conducted in March 2025 with 26 respondents, including TB Leprosy Control Assistant (TLCA), Field Organizers/Program Officers/ Non Government Organization (NGO) representatives.

The survey assessed device functionality, internet connectivity, software usability, and workload changes as part of the pilot. The objective was to evaluate how well the eTB-Manager performs in real-world conditions.

Results/Impact: Preliminary findings from the ongoing pilot show that 100% of participants had functional devices, though some faced performance issues and Subscriber Identity Module (SIM) card challenges. While 88.5% reported uninterrupted internet connectivity, all respondents found the software easy to use. A significant 96.2% reported a reduction in workload, with some experiencing up to 70% time savings in data entry. Statistical analysis shows a significant correlation between device functionality and workload reduction ($p < 0.05$), while internet connectivity did not significantly affect software usability ($p > 0.05$).

Conclusions: The ongoing pilot in Sherpur district demonstrates the potential of digital tools like the eTB-Manager to improve TB data management. However, challenges related to device performance, SIM card support, and internet connectivity in remote areas remain.

Recommendations include upgrading devices, improving rural connectivity, offline features of the system and ensuring continuous training and support for long-term success.

ABSTRACT PRESENTATIONS THURSDAY 20 NOVEMBER 2025

ORAL ABSTRACT SESSION (OA)

OA16 Reaching the hard-to-reach: Increasing access and uptake

OA16-249-20 Measuring TB stigma and Its impact on accessing TB care: A study of 15 countries

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Background and challenges to implementation: TB stigma remains a significant barrier to quality TB care. At the 2023 UNHLM on TB, countries committed to ending TB stigma by 2027. To reach this target, national TB responses must understand how stigma manifests at each stage of the TB journey.
Through the Challenge Facility for Civil Society, the Stop TB Partnership supported 15 countries to implement the TB Stigma Measurement Assessment, helping to identify stigma's impact and inform targeted interventions.
Intervention or response: The assessment used a standardized, civil society-led tool, guided by National TB Programmes (NTPs), to foster multi-stakeholder engagement, raise awareness, and develop stigma reduction strategies.
Oversight was provided by a steering committee composed of CSOs, NTP, people with TB (PWTB), and women. The tool applied qualitative and quantitative methods to assess stigma across the TB journey (from symptom recognition to post-treatment follow-up) in community, health, family, and work settings.
Community and healthcare worker perspectives on stigma were also included. Validated stigma scales (KNCV 2018) measured self-stigma, secondary stigma, and external stigma. A policy and legal workshop assessed rights-related frameworks and media coverage.
Results/Impact: Among 24,453 respondents across 13 countries, community stigma (26%) and self-stigma (25%) were most frequently cited as barriers to accessing TB services, followed by stigma in health facilities (20%), family (19%), and workplace (17%). The most common stigma point was during symptom recognition in the community. Sub-group analysis revealed women and key and vulnerable populations (KVPs) faced greater and differently experienced stigma. While protective laws existed in most countries, enforcement and media coverage were weak.
Conclusions: Community and health facility stigma during symptom recognition and treatment adherence stages most hindered TB care. TB programmes must focus on these areas and stages, and strengthen the implementation of legal protections and media advocacy to meet stigma reduction goals.

OA16-250-20 Content strategies on TikTok to address TB stigma: A quantitative study of the engagement on @TuberculosisTV

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Background and challenges to implementation: Tuberculosis (TB)-related stigma is a persistent challenge to TB prevention and treatment in high-burden countries such as Indonesia. Stigma can reduce care-seeking behavior, lead to treatment delays, and fuel discrimination. With the rising popularity of TikTok among youth and the general population, social media offers an innovative platform to address stigma. However, there is limited evidence on which content strategies are most effective in engaging audiences and reducing TB-related stigma.
Intervention or response: This study analyzes engagement data from the TikTok account @TuberculosisTV, which produced 643 TB education videos between 5 January 2023 and 12 April 2025. Of these, 52 videos directly addressed TB stigma and were categorized into four content types: entertainment (n = 22), personal identity or lived experience (n = 12), informational (n = 8), and social interaction (n = 10). We collected public engagement metrics including views, likes, comments, shares, and saves. Engagement Rate, defined as the sum of likes, comments, and saves divided by views, was used as the primary outcome metric.
Results/Impact: Personal identity content had the highest average engagement (Mean ER = 3.16%, SD = 1.4) followed by interaction (2.69%), information (1.51%), and entertainment (1.48%). A Welch ANOVA showed significant differences in ER across content types (CI(3, 17.93) = 9.28, $p < 0.001$) and in LTV (like-to-view ratio) (CI(3,

17.65) = 10.23, $p < 0.001$). The Games-Howell post hoc analysis showed significant differences between entertainment-personal identity content and entertainment-interaction content.

Content Type	Number of Videos	Mean Engagement Rate (ER) (%)	Standard Deviation (ER)	Mean LTV	Significant Differences (Games-Howell)
Entertainment	22	1.48	0.54	0.012	Lower ER than Identity (p = .005)
Personal Identity	12	3.16	1.40	0.033	Highest ER, Higher than Entertainment (p = .005)
Information	8	1.51	0.75	0.013	–
Interaction	10	2.69	0.85	0.023	Higher ER than Entertainment (p = .013)

Conclusions: Findings demonstrate practical applications for public health communication efforts, especially for programs seeking to reduce TB stigma through social media engagement. The study highlights lived experiences contents generated the most meaningful engagement to address stigma. These results can inform other digital health campaigns targeting stigma reduction in high-burden settings and support strategic content planning for wider dissemination. Future research should expand the dataset and incorporate qualitative insights.

OA16-251-20 Leveraging social media and television campaigns to raise awareness of tuberculosis during the war in Ukraine

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Background and challenges to implementation: In 2024, Ukraine launched a media campaign to combat persistent stigma and discrimination around tuberculosis (TB), which is a major barrier to healthcare access. The initiative aimed to disseminate accurate TB information amid wartime disruptions to traditional media, necessitating alternative communication channels to ensure population-wide reach.

Intervention or response: The campaign strategically combined television broadcasts with digital platforms, leveraging live YouTube streams and Facebook content to engage audiences. Reaching over 2.1 million people, the effort addressed stigma, gender-specific challenges, diagnostic accessibility, and innovative treatments.

Experts—including civil society representatives, scientists, doctors, and TB survivors—shared insights, while interactive social media Q&A sessions addressed public concerns directly.

Results/Impact: The campaign achieved over 2.1 million views across platforms. The broadcast on innovative TB treatments garnered the highest engagement (480,560 views), reflecting public interest in medical advancements. Workplace stigma discussions received 370,353 views, emphasizing the need for societal support. Topics like fear of stigma, gender dimensions, and diagnostic access each attracted ~400,000 views, demonstrating balanced public engagement. The hybrid television-digital approach proved adaptable and resilient in wartime, ensuring vital health information dissemination despite media disruptions.

№	Topic	Reach (TV + YouTube Live + Facebook)
1	Fear of stigma and discrimination – is a barrier to diagnosis and treatment	402311 views
2	Gender aspect of tuberculosis	426366 views
3	Innovative approaches to overcoming the tuberculosis epidemic in Ukraine	480560 views
4	Stigma and discrimination against people with tuberculosis in the workplace: how to fight it?	370353 views
5	Accessibility of tuberculosis diagnosis: new treatment methods, risk groups	415368 views
Total		2 094 958 views

Conclusions: The campaign highlights the effectiveness of integrating television and digital platforms to raise TB awareness during crises. High engagement with treatment innovations signals public demand for progress in TB care. Addressing stigma, gender disparities, and diagnostic access remains critical.

Future initiatives should prioritize multi-platform strategies and adapt to evolving media landscapes to maximize reach. Interactive formats, such as social media Q&As, enhance audience engagement and understanding by fostering direct dialogue.

This approach underscores the importance of flexible, participatory communication in public health messaging, particularly in conflict-affected settings.

OA16-252-20 The power of friendship: A child-centered comic to overcome tuberculosis stigma during war in Ukraine

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Background and challenges to implementation: Stigma is a key barrier to tuberculosis (TB) care, especially for children and adolescents. They often face isolation and discrimination, impacting treatment and mental well-being. The war in Ukraine worsened these challenges by displacing families, disrupting healthcare, and increasing stress.
Traditional awareness campaigns rarely engage children. There was a need for an innovative, child-friendly way to explain that TB is curable and that children deserve empathy, inclusion, and support.
Intervention or response: To address these challenges, an innovative approach was implemented through Ukraine's first child-centered TB comic, "The Power of Friendship: how Zlata overcame tuberculosis". It tells the story of a girl displaced by war and diagnosed with TB, who faces illness and social challenges with support from friends and family. Created with health professionals, educators, psychologists, and artists, the comic simplifies complex information in a supportive format. It is distributed freely and used in schools and outreach efforts to reduce TB stigma.
Results/Impact: By March 2025, over 5,000 children in Ukraine received the comic. Healthcare providers and psychologists observed positive effects in reducing fear, stigma, and isolation among children with TB.

The comic serves as both an educational tool and a source of emotional support. Its visual storytelling helps children relate to characters and understand the disease. Plans are underway to expand its use nationally through education and awareness programs, especially in conflict-affected regions.
Conclusions: The comic is an effective tool for reducing TB stigma and promoting empathy among children. It highlights that TB is curable and recovery depends on social support. Positive feedback from health and education professionals confirms its value. Plans are underway to expand its use in Ukraine. This model may be adapted globally in humanitarian settings.

OA16-253-20 Improving TB case detection among men at community level: A case study from Malawi

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Background and challenges to implementation: In Malawi, TB is two times more prevalent in men than women and men spend a year longer before being diagnosed with TB. There is paucity of data on interventions to improve early TB detection among men. To address this gap, we implemented a community-based TB screening intervention at community structures where men usually congregate.
Intervention or response: With funding from USAID, Partners in Hope, a Malawian, non–Governmental Organization, collaborated with Ministry of Health (MOH) to conduct intensified TB screening utilizing both mobilized men gatherings and existing male congregation points (workplaces, businesses, hangout spots) across six health facility catchment areas in Nsanje, Chikwawa and Lilongwe districts. A team of one Health Surveillance Assistant, four community volunteers, one HIV Diagnostic Assistant and one clinical staff used WHO 4-symptom screening tool to identify persons with presumed TB, who submitted sputum for laboratory TB testing at the nearest health facility or were further evaluated by a clinician if they failed to produce sputum. Screening sessions were coordinated through local leadership structures to ensure community participation. While focusing on men, females were included if they were willing to participate.
Results/Impact: From June to December, 2024, 6,803 individuals (6,104 males, 669 females) were screened for TB. Of these, 8.7% (593/6,803) had presumptive TB

symptoms, out of which 86.8% (515/593) managed to submit sputum. 7.4% (44/593) were diagnosed with active TB and were initiated on treatment out of which 90.2% (40/44) were men. Of all persons diagnosed with TB, 81.8% (36/44) were bacteriologically confirmed, none had drug resistant TB, and 4.5% (2/44) were persons living with HIV.

Conclusions: The intervention effectively targeted men, demonstrating success in reaching this underserved population. Strong coordination with MOH teams was key to successful implementation. Additional measures, including availability of on-site TB diagnostic equipment, such as mobile X-ray, may further enhance timely screening and diagnosis.

OA16-254-20 Challenges in TB screening among internally displaced persons. a case study of Benue state Nigeria

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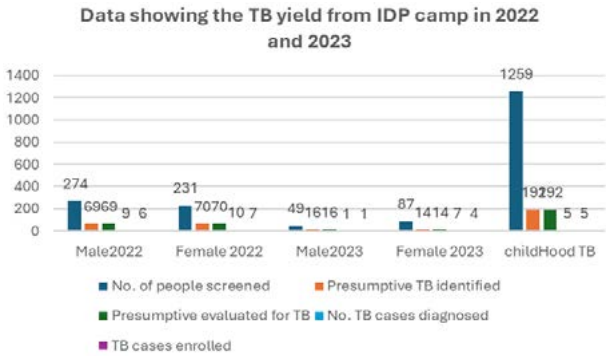
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge worldwide, with Nigeria ranking sixth globally, among the countries with the highest TB burdens. KNCV Nigeria, has continued to implement active TB case-finding withing the IDP to curtail the spread and manage appropriately this disease. The prevalence of TB in Benue state is exacerbated by socio-economic factors, HIV co-infection, and limited access to healthcare services, particularly among vulnerable populations such as people living with HIV, internally displaced persons (IDPs), and rural dwellers.

This paper explores the major challenges faced in TB screening within the IDP camp in Benue state.

Intervention or response: KNCV Nigeria through the LON 1&2 project implemented intensive active TB case-finding (ACF)activities such as community outreaches, mass screening of clients with the use of portable digital X-ray (PDX) machine and the presence of the Wellness on wheels (WoW) truck to boost TB cases finding within the IDP camps. Public TB awareness campaigns and educational programs, community workshops, and media campaigns were organized to improve knowledge about TB prevention and treatment and address issues around stigma. To close gaps around the integration of HIV and TB services, coordination of TB screening with HIV services was ensured to enhance early case detection and treatment initiation.

Results/Impact: Within a two-year implementation program (2022-2023), the project was able to screen **1,900** clients of which **361(19%)** of them were presumed to have TB from the community outreaches conducted within the camps. Presumptive identified who were successfully evaluated were **361**(giving a **100%** evaluation rate). Those who were diagnosed to have TB were **32(9%).** Children diagnosed from the total were **(15%)**. Challenges encountered were around cultural barriers and stigma.



Conclusions: Challenges of TB screening among vulnerable populations in Benue State requires a comprehensive approach that integrates community-based strategies, improved healthcare infrastructure, policy support, and educational efforts.

OA16-255-20 Prevalence and associated factors of tuberculosis among tea estate workers in Thyolo and Mulanje districts, Malawi: A cross-sectional study

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Background: Tuberculosis remains one of the major health problems in the tea gardens worldwide. . Early diagnosis of people with TB helps to cut transmission of the disease and also leadss to improved treatment outcomes. The World health organization launched the End TB strategy which aims at identifying all TB patients and putting them on treatment. Thyolo and Mulanje are the tea growing districts which has a high burden of TB and HIV in Malawi. There is paucity of data of TB burden among tea estate workers in Malawi.

This study was conducted to determine the prevalence and associated factors of TB among tea estate workers in Thyolo and Mulanje districts in Malawi.

Design/Methods: A cross section study was conducted in the tea estates of Thyolo and Mulanje targeting 1,068 estate tea workers. Multi stage random sampling was done to obtain a sample size. Socio-demographic, employ-

ment and clinical data was collected using a structured questionnaire. Chest x-ray and gene x-pert machine were used to test the participants for TB. Ethical clearance was obtained from National Health Sciences Research Committee, letter of authorization was obtained from Tea Association of Malawi, and district councils of Thyolo and Mulanje. Data analysis was conducted using SPSS version 25.

Results: A total of 976 participants took part in the study. Prevalence of TB was found to be 1.84% translating to 1840 TB patients per 100,000 population of tea estate workers. Level of education (P=0.012), type of employment (p=0.019), HIV status (p=0.046) and history of TB among household contact (p=<0.001) were factors associated with TB infection.

Conclusions: Prevalence of TB among tea estate workers is high yet not included among high-risk group targeted with TB interventions in Malawi. Therefore, there is need to strengthen TB control and prevention strategies among tea estate workers if we are to end TB by 2030.

OA16-256-20 Using people-centered approach to enhance active TB case finding in internally displaced persons (IDPs) during the war in Ukraine

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Background and challenges to implementation: Full-scale war started in February 2022 caused the unprecedent population migration both inside the country and abroad. This migration process is followed by substantial stress, prolonged stays in overcrowded places with inadequate ventilation (bomb shelters, evacuation trains), and irregular, poor meals. All these factors facilitate the spread of TB infection in the population. In 2024, there were about 4.4m IDPs in Ukraine of whom 60.5 thousand live in the places of temporary compact accommodations.

Intervention or response: Alliance has been working on ACF-TB in IDPs since 2018. Starting from 2022, the number of persons screened for TB symptoms as well as the number of diagnosed TB cases has increased. Since 2024, having shortage of finance and being unable to increase the number of IDPs screened for TB, Alliance has changed the approach of reaching the IDPs. Instead of screening those who apply to social services centers for social support, Alliance issued grants to 16 NGOs for identifying IDPs in the places of compact accommodation, therefore making TB screening services more accessible to IDPs. NGOs provide screening for TB symptoms, followed by medical examination in healthcare facilities for those who are screen-positive and enrollment in treatment for those with diagnosed TB.

Results/Impact: In 2024, ACF-TB is provided by 16 NGOs in 19 regions of Ukraine. Among other services, NGOs help IDPs to sign declarations with family doctors and provide payment for TB diagnostics services for those who lost their documents and therefore unable to sign the declaration.

	# of IDPs screened for TB symptoms	# of screening-positive	# and % of IDPs examined for TB in HCF	# of diagnosed TB cases. Total (susceptible/DR-TB)	NNI	# and % of enrolled in treatment	# of signed declarations with PHC Centers	# of IDPs received paid services in HCF
2021	10,149	2,832	2,832 (100)	13 (10/3)	218	13 (100)	2	5
2022	24,578	5,784	5,146 (89)	25 (23/2)	206	25 (100)	1	5
2023	39,830	11,630	10,447 (90)	78 (68/10)	134	78 (100)	2	29
2024	22,009	9,938	9,855 (99)	196 (163/33)	50	196 (100)	23	581

Conclusions: An innovative approach has allowed for the diagnosis of more TB cases without increasing the number of screened IDPs. Among all TB cases within IDPs diagnosed in Ukraine in 2024, 37% (196 out of 523) were diagnosed in projects funded by Alliance. A people-centered approach in service provision enables IDPs to seek TB screening and diagnostics in HCF.

OA16-257-20 Integrating tuberculosis services into mobile clinics in nomadic settings: An evaluation of the TB LON 1&2 Wellness on Wheels innovation in Bauchi State, Nigeria

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Background and challenges to implementation: Tuberculosis case detection and treatment outcomes are suboptimal in nomadic populations where access to health services is minimal. Responding to these challenges, especially among nomadic communities, necessitates innovative approaches to healthcare delivery. KNCV Nigeria's introduction of the Wellness on Wheels (WOW) Truck initiative under the USAID-funded TB LON 1&2 project marks a significant stride towards improving access to TB diagnostic and treatment services in these remote and underserved areas.

This study evaluates the impact of this mobile clinic initiative in Bauchi State, highlighting its potential to enhance TB case finding and treatment in nomadic settings.

Intervention or response: The WOW Truck, a mobile TB diagnostic unit funded by USAID, was launched in Bauchi State in November 2022, targeting nomadic and hard-to-reach communities. The truck provides free TB screening and diagnostic services alongside general healthcare. Equipped with a digital X-ray machine,

CAD4TB (Computer Aided Detection for TB) software, and two four-modular GeneXpert machines, it facilitates timely TB diagnosis in remote areas, including nomadic settlements.

Results/Impact: We analyzed data from the nomadic population screened using the WoW truck between January and October 2023. With a 27% TB yield, the findings highlight a significant outcome in TB case detection within the nomadic population in Bauchi State.

Notably, this increase in cases coincided with the rainy season, when the nomads are more settled, suggesting that the period of increased settlement may contribute to higher case detection.

Reporting Period	Number clients screened for TB	Number of presumptive TB cases identified	Number of presumptive TB cases who completed evaluation	Total number of TB cases diagnosed	Total number of TB cases started on treatment	TB YIELD%
Jan-23	3437	122	122	24	24	20%
Feb-23	3268	162	162	48	48	30%
Mar-23	2966	82	82	8	8	10%
Apr-23	2646	180	180	27	27	15%
May-23	3592	184	184	33	33	18%
Jun-23	1912	55	55	21	21	38%
Jul-23	2908	147	147	59	57	40%
Aug-23	4395	142	142	37	37	26%
Sep-23	3580	162	162	61	61	38%
Oct-23	2947	155	155	63	62	41%
TOTAL	31651	1391	1391	381	378	27%

Conclusions: The WOW Truck initiative in Bauchi state represents a novel model for delivering TB and general healthcare services to nomadic communities. Its success in increasing TB case detection underscores the importance of mobile health interventions in addressing health disparities. While the initial outcomes in Bauchi State are encouraging, sustained funding and strategic expansion are essential to capitalize on its full potential to contribute to the eradication of TB in Nigeria

OA16-258-20 Prevalence of tuberculosis among people with substance abuse disorder: Lessons on collaboration with traditional mental health homes for TB case detection in Southwest Nigeria

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Background and challenges to implementation: Prevalence of Tuberculosis (TB) among people with Substance abuse disorder is notably higher than the general population as they are likely to contract TB due to factors such as weakened immunity and co-occurring health issues. In Nigeria, traditional mental health homes served as the first point of treatment for most with such condition due to cultural belief. USAID Tuberculosis Local Organization Network 3 (TB LON 3) aimed to find the missing TB cases among high risk groups by conducting TB screening activities in traditional mental health homes.

Intervention or response: Between November 2022 and August 2023 four traditional mental health homes were purposively selected. Advocacy and engagement visits were paid to the stakeholders outlining the signs and symptoms of TB and its determinants which include alcohol use disorder, smoking and substance abuse.

TB screening was done using WHO 4 clinical questions checklist and emphasis placed on other risk factors such as history of contact with chronic cough. Sputum samples collected were analyzed using GeneXpert MTB/Rif Assay.

Results/Impact: A total of 741 persons were screened, 264 (35%) presumptive TB cases identified and evaluated with 66 (25%) TB cases (61 DSTB, 5 DRTB) diagnosed and commenced on treatment and notified to the National TB program. Number needed to screen (NNS) and Number needed to test (NNT)was 11 and 4 respectively compared to 54 and 9 among similar high-risk groups on the USAID TBLON 3 Project.

Conclusions: This intervention shows a high prevalence of Tuberculosis among persons who suffer from substance abuse disorder and its implication for public wellbeing. Collaboration and effective engagement with traditional mental health home in TB endemic region shows promise as a replicable model for high-risk population in the End TB strategy especially in communities where cultural beliefs influence the general health seeking behavior of the people.

OA17 TB screening and finding TB in marginalised populations

OA17-259-20 Finding tuberculosis among children in seemingly safe places, lessons from multi-sectoral collaboration on TBLON3 in Ogun State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) among children is a public health problem of special significance as it is a marker for recent transmission of TB in the community. The USAID TBLON-3 project aimed to halt ongoing transmission by conducting TB screening in schools, orphanages and other informal schools. This is especially crucial in settings where children are exposed to risk factors that predispose them to TB such as malnutrition and overcrowding.
The aim of the intervention is to increase childhood TB case detection and demonstrate the effectiveness of multisectoral engagement in finding Tuberculosis among children.
Intervention or response: This intervention required collaborative efforts across multiple sectors, the Ministry of Education, Ministry of Women Affairs and Social Development, as well as religious bodies to locate and engage with these children effectively.
Increased resources, including manpower, funding and Social and Behavioural Change communications (SBC) materials, were mobilized to create awareness for TB screening activities**.**
Volunteers were trained on screening using WHO 4 clinical questions with emphasis on other peculiar signs and symptoms of TB in children. 4 public schools,3 orphanages and 7 Qur'anic schools were selected from TB Hotspots mapped using an AI-enabled geospatial mapping platform.
Results/Impact: The screening was done between Oct 2022- Aug 2023 with a total of 2,121 children screened,541 presumptive identified (26% yield) and evaluated using GeneXpert. 53 TB cases were diagnosed, NNS is 40 and NNT is 10 respectively which is more efficient compared to screening in an infant welfare clinic. 51(96%)of the cases identified were enrolled on treatment and notified to the National TB Program.
Conclusions: Multi-sectoral targeted screening for childhood TB cases is a highly effective and efficient way of reaching out to children who may not present in health facilities as they are presumed to be healthy, sustaining this collaboration can help reduce child mortality due to Tuberculosis.

OA17-260-20 Efficiency of different active TB case-finding strategies among coal mine communities in Pakistan

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Background: Among high-risk groups, coal miners are particularly vulnerable due to their occupational exposure to coal dust, which compromises lung function and increases risk of TB.
Design/Methods: This cross-sectional study was conducted in 2020/21 to detect active tuberculosis among returnee coal-miners (RCM) and their associated-communities (ACM) in six districts of Pakistan with high concentrations of coalminer workforce. Three different active-case-finding (ACF) strategies were employed. Ultra-portable chest X-ray (CXR) machines equipped with AI were used for screening in camps, whereas verbal screening was used in camps and communities. People screened positive were tested using Xpert MTB/RIF. TB prevalence in 100,000, number needed to screen (NNS) and number needed to test (NNT) to find one bacteriologically confirmed TB case were calculated and analysed stratified by screening strategy.
Results: A total of 150,242 individuals including 44% RCM were reached. Of these 8.3% were screened by CXR in camps, 91% by verbal screening in camps (10%) and community outreach (81%). Among individual screened by symptoms, 45% of RCM and 15% of ACM had symptoms whereas proportion with CXR suggestive of TB was similar in both (10-11%). NNS to find one TB case was lowest among RCM group screened by CXR (n=87) and among ACM screened by symptoms(n=134). TB was diagnosed in 226 RCM and 204 ACM. The estimated TB prevalence in RCM was 341 and 243 in ACM. However, the estimates of TB prevalence varied significantly with screening strategy and among RCM population it ranged from 1156/100.000 in group screened by CXR followed by 566/100,000 in group screened by symptom in camps and 177/100K in those screened by verbal screening in community outreach.
Conclusions: With CXR screening, the low NNS and NNT, along with threefold higher estimates of TB prevalence, underscore the efficiency of CXR in detecting TB in a population with a high prevalence of symptoms.

OA17-261-20 Tuberculosis case finding among internally displaced persons: Navigating hard-to-reach underserved communities of Adamawa State, Northeast Nigeria

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Background and challenges to implementation: Since 2016 internal Organisation for Migration (IOM) estimated over 3 million people were displaced in Northeast Nigeria due to insurgent activities. Internally Displaced Persons (IDPs) face significant barriers in accessing timely and quality health services including tuberculosis (TB) due to their remote/hard-to-reach locations, insecurity, and often restricted movement among other factors.
As part of the Uniatid supported Start4All project, we implemented a community-based active case finding (ACF) targeting IDP communities in hard-to-reach areas of Adamawa State. We document the contributions of ACF in IDP communities of Adamawa State.
Intervention or response: From August 2024 to January, 2025, 39 screening sessions in 35 IDP communities of Adamawa State were conducted through mobile outreaches using portable digital CXR with AI-interpretation to screen individuals ≥15. People with qXR AI score of ≥0.3 were considered to have presumptive TB and had their sputum collected, transported and tested with Xpert MTB/RIF Ultra.
Results were actively retrieved, people confirmed with TB were promptly linked to treatment while those found to be Bac- were further reviewed by radiologists/medical officers and managed appropriately.
Results/Impact: 60 volunteers were identified and trained on TB prevention and care from IDP host communities. Overall, 1,208 individuals (including 755 females) were screened with CXR-AI. Of these, 180 individuals (15%) had AI scores ≥0.3 and were tested using GeneXpert MTB/Rif. 67 people were diagnosed with TB including 8 with Bac+ TB; 24 (36%) were females.
All people confirmed with TB were successfully initiated on treatment.
Conclusions: Community-based ACF using CXR-AI is effective in the timely detection and initiation of IDPs on treatment. Such targeted outreaches can bridge the diagnostic gap among IDPs and accelerate progress toward ending TB.

OA17-262-20 Active tuberculosis case finding using digital chest X-ray with artificial intelligence in prisons of Nepal: An initial experience

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Background and challenges to implementation: Nepal's National Tuberculosis Program (NTP) estimates 68,000 annual TB cases (229/100,000 population), with 40% remaining undiagnosed. The National TB Prevalence Survey 2018-19 Nepal reported that 72% of TB cases were asymptomatic, highlighting gaps in passive case detection and limitations for screening for TB using only symptoms screening. To address this, the NTP piloted AI-enhanced DELFT light chest radiography (CXR) and Computer-Aided Detection (CAD4TB) to improve TB case detection in prisons. Prioritizing prison settings recognized globally as high-risk TB settings, which often face overcrowding, limited access to health care, poor ventilation and undernutrition thereby amplifying transmission risks.
Intervention or response: Coordination with Department of Prison Management for official permission and chosen the prisons which have > 500 inmates and not doing screening camps regularly. Camps were organized after orientation session to the prison staff and health workers.
All inmates and staff underwent symptomatic screening with questionnaire, digital-CXR analyzed with CAD4TB software (threshold score ≥35). Sputum for presumptive cases were tested using molecular WHO-recommended rapid diagnostic test (GeneXper)t and Pulmonary clinically diagnosis was made based on CXR findings. All diagnosed TB cases were promptly enrolled in treatment.
Results/Impact: Of 1,514 participants (median age 31; 98% male, 2% security staff), 28 (1.8%) had prior TB history, 9% (139/1514) were current smokers. Screening identified 75 (5%) presumptive cases (symptoms or CAD4TB scores ≥35). Twelve (0.8%) were diagnosed with TB: 6 bacteriologically confirmed (MTB -positive),17% (1/6) female and 6 clinically diagnosed made based on chest X-ray findings. The TB prevalence in prisons was 794 per 100,000 which is three times higher than Nepal's national estimates.

Conclusions: Prison TB prevalence far exceeds national estimates, underscoring the urgency of routine AI-enhanced CXR screening in such high-risk settings. Early diagnosis, treatment, and targeted interventions will support in halting the TB transmission and advance global TB elimination goals.

OA17-263-20 Reaching the unreached: Programmatic innovations for identification of tuberculosis (TB) among underserved populations in Bangladesh

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Background and challenges to implementation: Bangladesh bears a high tuberculosis (TB) burden, with vulnerable populations facing the greatest barriers to diagnosis and care. Groups such as slum dwellers, industrial and transport workers, children, the elderly, and residents of remote areas often experience delayed diagnosis due to socio-economic challenges, limited awareness, stigma, and poor access to health services. These barriers contribute to ongoing transmission and underscore the need for equitable, people-centered TB service delivery.
Intervention or response: To address these gaps, BRAC, a development organization, implemented targeted interventions to enhance identification of TB among high-risk and underserved populations. Sputum collection centers were set up in factories, garments, and transport terminals, focusing on industrial and transport workers. Special TB campaigns and sputum collection initiatives were carried out in rural remote and hard-to-reach areas. Screening services were also expanded to urban slums, brickfields, tea gardens, and tailored to reach children and elderly individuals. Cough pots were distributed to potential persons with presumed TB, and collected samples were transported to nearby laboratories for molecular testing, ensuring timely diagnosis and treatment initiation.
Results/Impact: A total of 42,336 persons with presumed TB were tested among transport and industrial workers, resulting in 2,994 confirmed TB patients. Among urban dwellers and vulnerable groups like children and elderly people, 29,431 persons with presumed TB were tested, leading to detection of 2,111 TB patients. Furthermore, 94,260 TB persons with presumed TB were tested by special TB campaign and outreach initiatives in rural remote communities, resulting in 7,115 TB patients' identification.
Conclusions: BRAC's innovative, community-based approaches have improved access to TB services for underserved groups, promoting early diagnosis and equitable care. These models demonstrate the effectiveness of tailored, inclusive service delivery in strengthening national TB control efforts. Sustained investment and scale-up of such inclusive, people-centered approaches are vital to achieving Bangladesh's End TB targets and leaving no one behind.

OA17-264-20 Enhanced diagnosis of asymptomatic tuberculosis in vulnerable populations: Impact of the 100 days TB Mukt Bharat Abhiyan compared to previous year

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Background and challenges to implementation: India's tuberculosis (TB) burden remains among the highest globally, with a substantial proportion of cases going undiagnosed—particularly among asymptomatic individuals. As per the National TB Prevalence Survey, 63.6% of symptomatic individuals did not seek care, and many TB cases present without typical symptoms. To address this diagnostic gap, the Government of India launched the 100 Days TB Mukt Bharat Abhiyan on December 7, 2024, with a key focus on screening vulnerable and high-risk populations for early and often asymptomatic TB detection.
Intervention or response: The campaign implemented an aggressive, multi-sectoral approach in 347 high-burden districts, combining mobile diagnostics (Ni-kshay Vahans), handheld X-rays, and NAAT-based molecular testing. High-risk groups—such as undernourished individuals, the elderly, PLHIV, diabetics, and TB contacts—were systematically line-listed and screened through Ayushman Arogya Mandirs and public outreach platforms. Community participation was enabled through Jan Bhagidari, with support from elected representatives, health workers, and civil society actors.
Results/Impact: From December 7, 2024, to March 17, 2025, **2,85,033 asymptomatic TB cases** were diagnosed with a **120% increase** compared to **1,29,464 cases** during the same period in 2023. This significant rise demonstrates the effectiveness of the campaign's targeted screening strategy, advanced diagnostics, and proactive community engagement. The integration of X-ray and NAAT technologies was instrumental in detecting cases that would have gone unnoticed, allowing for earlier intervention and treatment initiation.
Conclusions: The 100 Days TB Campaign markedly improved the detection of asymptomatic TB cases, reaffirming the value of community-based, technology-enabled screening in high-risk groups. These outcomes strengthen the case for sustained, intensified efforts as India strives to eliminate TB.

OA17-265-20 Addressing tuberculosis at the nexus of incarceration and conflict: Computer-aided detection-based mobile active case finding in prisons of Haiti and the Central African Republic

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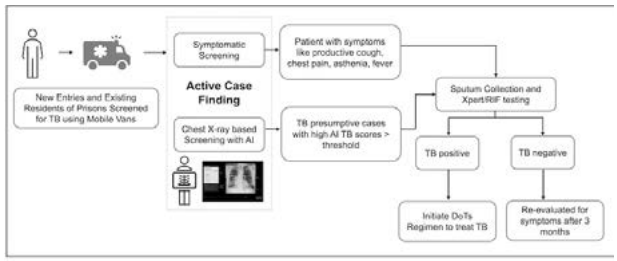
Background and challenges to implementation: Mobile digital chest X-ray screening with WHO-endorsed computer-aided detection (dCXR+CAD) was used for Tuberculosis (TB) detection in prisons in Haiti and the Central African Republic (CAR). These two low-income countries, facing post-conflict challenges, overcrowded prisons, and a high TB burden (incidence rates of 254 and 540 per 100,000, respectively), were selected for Active Case Finding (ACF) to improve case identification and address inmate vulnerabilities.
Intervention or response: Health through Walls (non-governmental organization) facilitated ACF using dCXR+CAD across 17 and 5 prisons in Haiti and CAR respectively, from March 2023 to December 2024, to systematically screen all newly admitted and existing inmates. Those flagged with a CAD-generated probability score ≥0.5 were classified as TB presumptive and were subsequently confirmed microbiologically using Xpert MTB/RIF and smear microscopy. Treatment was initiated in line with national TB program protocols.



Active case finding workflow implemented at the prisons for early TB triage and treatment.

Results/Impact: In Haiti prisons, 9465 individuals were screened, 547 individuals (5.7%) were flagged by dXR+CAD as TB presumptive, and 236 (TB positivity rate:43.14%; 95% CI: 38.95–47.41%) were microbiologically confirmed. While in CAR prisons, among the 2301 inmates screened, dXR+CAD triaged 281 (12.2%) for TB and 66 cases (TB positivity rate: 23.5%; 95% CI: 18.7–28.9%) were Xpert MTB/RIF confirmed. It was found that the number needed to screen to get one confirmed TB case was 40 in Haiti prisons and slightly lower in CAR (34.8). Notably, a higher proportion of confirmed TB cases had a greater TB score (≥0.90) in CAR (69.1%) than in Haiti (38.13%). The positive predictive value of dXR+CAD for TB detection was 75.2% (95% CI: 70.0–79.8%) in Haiti; this was not estimated for CAR due to unavailable data.
Conclusions: ACF using dCXR+CAD is a feasible and effective strategy to detect TB that is missed by traditional symptomatic screening, particularly in high-risk populations, with dual vulnerabilities like prisons in conflict settings.

OA17-266-20 Facilitators and barriers for the implementation of peer-led tuberculosis active case finding among people who use drugs in Dar es Salaam, Tanzania

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Background and challenges to implementation: In 2023, an estimated 2.7 million cases of TB were undiagnosed or unreported. To address missing cases, the World Health Organization recommends systematic screening synonymous to TB active case finding (TB-ACF). Despite the high incidence and prevalence of TB among people who use drugs (PWUD), there is a significant gap in data, on their perspectives, regarding the implementation of TB-ACF services. We aimed to explore facilitators and barriers to implementing peer-led TB-ACF, as perceived by both, current and potential service users.
Intervention or response: We conducted in-depth interviews among:
1. Peer PWUD with prior history of illicit drug use and medication-assisted treatment (MAT) (n=10),
2. Current medication-assisted treatment service users receiving clinic-based daily methadone (n=8), and;
3. Community PWUD not on MAT recruited from various community locations (n=4).
All peer PWUD were experienced in TB-ACF. Thematic content analysis was utilized with the support of NVivo12.
Results/Impact: Two categories, individual and structural, with three main themes (1) facilitators, (2) facilitators for targeted improvement and optimization and (3) barriers) were identified. A critical facilitator was the acceptability of peer PWUD in providing TB ACF services. Key facilitators for improvement and optimization included the TB screening tool, mobile TB diagnostic services, integrated methadone/TB services, and monetary incentives to peer PWUD. Barriers included a reluctance to wear face masks due to stigma, misconceptions that prior TB preventive therapy among peers negates their need for protective preventive measures, high mobility of PWUD and the fear of withdrawal symptoms associated with the use of anti-TB medication, leading to non-adherence to TB treatment.
Conclusions: We highlight the crucial role of peer-led approaches in enhancing TB-ACF among PWUD. Peer acceptance as service providers highlights the potential

of community-driven interventions. Future research should explore the feasibility of providing peer-supported TB diagnosis and treatment services at friendly drop-in centers.

OA17-267-20 Integrated NCD and TB screening to improve active case finding in India

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Background and challenges to implementation: In India, stigma associated with TB leads to delayed diagnosis and treatment. Diabetes, undernourishment, alcohol or tobacco consumption are some of the established key vulnerabilities for tuberculosis in India. However, identification and thereby screening of key & vulnerable populations continues to be a major impediment for ACF interventions due to distance and time, unavailability of sufficient trained health workers, TB stigma and treatment costs.
Intervention or response: Through the Global Fund C19RM grant, William J Clinton Foundation, under the aegis of the Central TB Division (Government of India) has undertaken active case finding for TB in community settings in India through an integrated service delivery-based model, using 41 CAD enabled X-Ray devices. ACF camps, referred to as "Express health camps", involve opportunistic NCD & BMI screening along with TB.
This integrated approach reduces TB stigma, lowers community OOPE, enables targeted mobilization in communities and improves identification of TB-comorbidities such as diabetes and undernourishment.

Category	Availability	Footfall/camp in Presence of	Footfall/camp in Absence of	Difference %
NCD test Availability	Blood Pressure	83	60	+38%
	Random Blood Sugar	83	66	+25%
Health Staff Availability	Accredited Social Health Activist (ASHA)	91	59	+54%
	Auxiliary Nurse Midwives (ANM) or Staff Nurse	87	68	+28%
	Community Health Officer	89	64	+39%

Table.

Results/Impact: Data was analyzed for 10,238 camps held between April 2023 to February 2025. By integrating additional services such as Blood Pressure (BP), Random Blood Sugar (RBS), the camp footfall increased by 38% and 25% respectively.
Additionally, the presence of community level workers improved targeted mobilization of high priority KVPs, that directly resulted in higher case detection rates across all cohorts. 19% of the beneficiaries had BMI<18.5 that contributed to 40% of the total TB confirmations; while tobacco and alcohol consumers formed 33% and 14% of the total cases detected, the KVPs being non-mutually exclusive.
Conclusions: NCD Screening and the involvement of community health workers is crucial for mobilization of targeted populations for community ACF.
Lower footfalls in the absence of NCD indicate that stand alone ACF camps do not adequately serve the community needs - integrated health camp approach targeting the determinants of TB should be the default ACF design.

OA17-268-20 Formative evaluation of community wide screening using ultra-portable handheld X-rays in urban slums of Delhi, India

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Background: Delhi is the state with highest burden of TB in India (>700/100000) and studies revealed that 69% did not seek care for their TB symptoms. At least, 14 million individuals live in urban slums of Delhi, with limited access to health care.
A community wide screening using ultra-portable handheld X-rays devices with CAD for TB and testing using rapid molecular test has been implemented in select urban slums since January 2025.
Design/Methods: A multidisciplinary implementation team has been constituted. Logic model, activity plans and standard operating procedures were developed. Formative evaluation has been integrated into the implementation of intervention *to guide the design process.* Project management information system has enabled real-time monitoring of cascade of care data.
Weekly reviews were conducted with the project staff with an intention to optimize operations and document the learnings. Weekly field visits were made and field notes were prepared based on participant observation. Fidelity was assessed using a structured checklist, activity log and administrative data.
Results: A total of 5601 X-rays were taken, 1241 were abnormal. Average number of X-rays taken per day per X-ray unit is 72 (40-123) and is only limited by the number of beneficiaries mobilized from the community.
Number Needed to Test to detect a case of TB was 7 and Number Needed to Screen was 35. Only 70% of presumptive TB could be offered a test. The leaks were minimal in areas where spot collection of specimen and transportation happened.

Major challenges were convincing asymptomatic clients for sputum tests, perceived stigma of the community, unstable internet connection and identifying places to store X-rays on a daily basis.
Conclusions: Project's logic model is plausible, community is responsive. Interventions are being delivered with increasing fidelity and the short-term outcomes are encouraging. Spot collection of specimen and transportation is recommended.

OA18 Building sustainable systems and workforce

OA18-269-20 Leveraging WHO standards to improve TB diagnostic access for universal health coverage in Zambia

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Background and challenges to implementation: A major goal of Universal Health Coverage (UHC) for Tuberculosis (TB) is to provide access to rapid, accurate TB diagnostics without creating financial hardship for patients. In 2020, TB case detection rate in Zambia was estimated at less than 70 percent of total incidence. This was largely attributable to limited access to diagnostic services. This study utilized the WHO standard benchmarks to assess national TB diagnostic coverage, identify gaps, and evaluate progress over time.
Intervention or response: We conducted a national-level assessment using the WHO standards checklist comprising 12 benchmarks across the four steps of the diagnostic cascade: identifying presumptive TB, accessing testing, being tested, and receiving a diagnosis. The assessment covered 3000 health facilities across all 10 provinces of Zambia. We analyzed data from the national laboratory information system covering the period from 2022 to 2023 (annually).
Results/Impact: Access to rapid diagnostic tests improved from 68% in 2020 100% in 2023, with 96% of patients having a WRD test as the initial diagnostic test. The average turnaround time decreased from 7+ days in 2020 to 4 days in 2024. Lusaka province had the highest access (100%) and Western province the lowest (92%). Proportion of samples tested onsite increased 2-fold from 25% to 50%. The average distance traveled per sample decreased from 100km to 50km. The percentage of test results delivered within the same day increased from 26% in 2020 to 56.3% in 2023.
Conclusions: The WHO Benchmarks checklist proved effective in assessing both system capacity and programmatic requirements for TB diagnostics in Zambia. Zambia identified specific gaps in the diagnostic cascade and targeted resources to strengthen the TB diagnostic network. Continued application of these standards will be essential for monitoring progress toward ending TB in Zambia.

OA18-270-20 Building resilient health systems: Enhancing tuberculosis control in Ghana's private sector through capacity building

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Background and challenges to implementation: The private sector provides approximately 40% of healthcare services in Ghana yet remains underutilized in the screening and management of tuberculosis (TB). Due to this historical under-engagement, the private sector faces limited workforce capacity for effective TB care – including lack of awareness of national guidelines - posing a major barrier to achieving national TB elimination goals.
Intervention or response: To address these gaps, Aurum Institute Ghana launched a capacity-building intervention in 2024 through the Public-Private Mix initiative of the Global Fund Cycle 7 grant. The program trained 375 private sector health providers - including doctors, nurses, pharmacists, laboratory personnel, and data officers - across 90 high-volume private health facilities. The blended learning approach combined in-person workshops on TB screening, diagnosis, treatment protocols, and case notification guidelines with onsite mentorship and supportive supervision. Digital reporting tools were introduced to improve real-time case notifications and enhance linkage to public health systems. Pre-training assessments revealed deficiencies in TB symptom recognition, diagnostic practices, and adherence to treatment guidelines.
Results/Impact: Post-training evaluations demonstrated significant improvements in TB case detection, diagnostic accuracy, and adherence to national treatment guidelines. Pre-training assessments showed a 42% knowledge gap in symptom recognition and a 50% deficiency in diagnostic practices. Post-training assessments indicated a 90% improvement in symptom identification, 85% improvement in diagnostic accuracy, and enhanced adherence to treatment protocols. Evaluations were executed through quizzes, case studies and observational assessments. Key outcomes included the identification of 602 new TB cases within a year, improved treatment initiation, reduced loss to follow-up, and strengthened public-private collaboration.
Conclusions: This intervention highlights the potential of capacity-building initiatives to strengthen TB control in the private sector. By improving provider knowledge and fostering public-private collaboration, this model offers a scalable framework for optimizing TB services, contributing to global TB elimination goals.

OA18-271-20 Capacity building for health workers: Enhancing prevention of mother-to-child transmission (PMTCT) and TB/HIV services in resource-constrained environments – The Katsina experience

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Background and challenges to implementation: Mother-to-child transmission of HIV, alongside TB/HIV co-infection, remains a significant public health challenge in resource-limited settings like Katsina State, Nigeria. Barriers such as inadequate healthcare infrastructure, insufficient skilled personnel, and weak community engagement hinder effective delivery of Prevention of Mother-to-Child Transmission (PMTCT) and TB/HIV services. To address these challenges, KNCV Nigeria, with funding from the Global Fund, is implementing a three-year TB/HIV grant aimed at strengthening healthcare capacity to improve TB/HIV outcomes.
Intervention or response: In September 2024, a structured capacity-building program trained 614 individuals, including community TB/HIV workers, Community volunteers, mentor mothers, and traditional birth attendants. Training covered TB screening, HIV testing, counselling, referral pathways, and linkage to care for TB/HIV-positive pregnant women.
The community TB/HIV workers and Traditional birth attendants facilitate TB/HIV outreaches, while mentor mothers provided continuous support to HIV-positive mothers. A data-driven approach monitored the impact of the intervention, focusing on TB/HIV testing rates and treatment coverage.
Results/Impact: From October to December 2024 a total of 31,704 pregnant women were screened for TB/HIV, with a 2.2% HIV positivity rate. All HIV-positive pregnant women were linked to antiretroviral therapy (ART), significantly reducing the risk of mother-to-child transmission. 1967 presumptive cases were identified and evaluated. 78 pregnant women were diagnosed with TB and enrolled on treatment.
Conclusions: These results demonstrate the effectiveness of capacity-building strategies in strengthening PMTCT and TB/HIV services in resource-constrained settings. Strengthening health worker capacity is key to improving

PMTCT and TB/HIV outcomes. Future efforts should focus on expanding service coverage, strengthening health systems, and fostering strategic partnerships for long-term impact..

OA18-272-20 Sustaining best practices: An iECHO hub model

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Background and challenges to implementation: There are over 200 TB/HIV-focused ECHO programs globally but limited multi-country ECHO Hubs. The ECHO platform allows for easy participant management, scheduling sessions, and collecting demographic data such as country, institution, and profession. It is accessible through mobile devices, apps, and web browsers. TB GAPS ECHO Hub launched in September 2023 and supports disseminating evidence-based best practices across multiple high-TB burden countries: Eswatini, Lesotho, Malawi, Tanzania, and Uganda.
Intervention or response: A core team consisting of site leads and partners developed a schedule of monthly sessions and quarterly webinars on pediatric TB prevention, screening, diagnosis, and treatment. A digital flyer supplied participants with detailed registration instructions for the ECHOHub. Participants and partners are engaged with reminder emails directly through the platform for each session. The ECHO Hub houses pediatric and adolescent TB and TB/HIV guideline updates, provider and implementation job aids, and forums for sharing experiences to strengthen clinical, research, and policy competencies.
Results/Impact: Between September 2023 and March 2025, the program hosted 13 sessions with holiday breaks on topics in pediatric and adolescent HIV/TB prevention, care, and treatment. Of the 198 registered participants, 114 were regularly active, with an average attendance of 23 learners per completed session. The geographic reach included 14 countries and 61 learning sites. Participants represented implementing partners, clinicians, and providers. Other audiences included representatives from Ministries of Health, National Tuberculosis, and AIDS control Programs.

Conclusions: The platform's ease of use and ability to collect and analyze participant data make it a valuable tool for expanding the reach of TB best practices globally. Global reach allowed formal collaboration with the Lesotho MOH ECHOHub and presentations from colleagues and partner projects. This collaboration contributes to the ECHO hub's long-term plan for sustainability, integrating into existing regional systems.

OA18-273-20 Utilizing a grading tool to improve performance of reference laboratories in India's National TB Elimination Programme

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Background and challenges to implementation: The laboratory network under the National TB Elimination Programme (NTEP) of India is one of the world's largest, aiming to provide high-quality TB diagnostic services with a patient-centric approach. The NTEP recognizes TB control efforts in states using a standardized process to identify strong performers, but similar processes to recognize TB laboratories is lacking.
Intervention or response: To identify programmatic areas for improvement and enhance laboratory performance for better diagnostic services, the Central TB Division (CTD) developed a tool to assess the performance on mandated functions of strategic TB laboratories (Interme-

diate Reference Laboratories; IRLs), including diagnostic service quality, supervision, and monitoring. The grading tool is a structured questionnaire in an Excel file, grouped into nine thematic areas. The tool was initially piloted at two National Reference Laboratories (NRLs) and linked IRLs. Subsequently, 31 IRLs self-assessed themselves using the tool.

Results/Impact: The first round of self-assessment by IRLs was completed and scores were analyzed for 28 IRLs with complete information. Most IRLs scored higher in implementing standard operating and technical procedures, and participating in external quality assessment programs, as per NTEP policy. IRLs scored lower in completing the diagnostic testing cascade, supervision and monitoring activities, followed by biosafety and human resource availability and competency (Figure 1).

These findings highlight scope of improvement and the need for targeted capacity building for identified components. Routine self-assessment by IRLs will empower laboratories to identify persistent weaknesses and work with the CTD and NRLs to take corrective actions to improve performance.

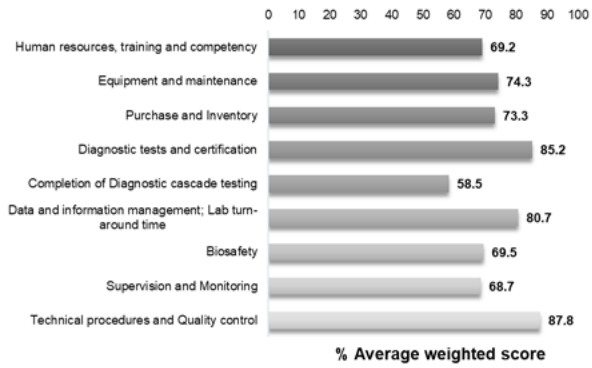

Figure 1. Percentage average scores in the nine thematic areas.

Conclusions: The tool empowers laboratory managers and program managers at state and national levels to understand existing strengths, critical gaps, and underlying challenges. The tool builds NRL and IRL governance capacity for TB diagnostic services, allowing them to institute corrective actions and healthy competition among state-level TB laboratories.

OA18-274-20 Empowered to power machines: GeneXpert superuser model optimizing TB diagnostics in Kenya

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Background and challenges to implementation: The GeneXpert platform has revolutionized TB diagnostics by enabling rapid and accurate molecular testing. However, challenges such as frequent instrument errors, prolonged equipment downtime, suboptimal utilization, and delays in Service-Level Agreement (SLA) follow-up have hindered its full potential in high tb-burden settings.

To address these gaps, Kenya introduced a GeneXpert Superuser model aimed at decentralizing technical expertise, strengthening diagnostic networks, and enhancing system responsiveness.

Intervention or response: Experienced laboratory professionals were identified and trained as GeneXpert superusers in all 47 counties. The training focused on advanced troubleshooting, error code interpretation, basic module repair, SLA monitoring, and remote support tools. Each superuser was assigned a cluster of facilities within their County to provide real-time technical support, mentorship, and performance monitoring. Superuser quarterly review meetings were conducted to assess the impact on key performance indicators.

Results/Impact: A total of 211 GeneXpert sites supported by GeneXpert superusers demonstrated marked improvements across key operational metrics. Equipment downtime has significantly reduced due to on-site technical troubleshooting and timely escalation of issues. Error rates decreased as users received prompt guidance on pre-analytical and analytical procedures. Utilization rates improved from 2022 (24%) to 2023 (38%) and 2024(49%) in the recent three years, driven by increased user confidence and reduced machine idle time.

Additionally, SLA follow-up became more effective, with all reported issues being resolved within the contracted timeframe. The model also fostered peer learning and boosted regional ownership of diagnostic quality.

Conclusions: The Superuser model is a practical, scalable approach that enhances diagnostic performance, reduces delays, and ensures the continuity of TB testing services. Its success in Kenya highlights its potential for adoption in other countries, aiming to strengthen molecular diagnostic networks.

OA18-275-20 Closing the diagnostic gap: How Nigeria's optimized sample transport networks boosted TB case detection by 105% – A model for scale-up?

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Background and challenges to implementation: Timely tuberculosis diagnosis remains challenging in low-resource settings like Nigeria, where 2022 case detection was only 50% (WHO). Kano State's high burden and logistical hurdles especially in hard-to-reach areas worsened delays. This Global Fund supported study (2022–2024) assessed an optimized sample referral system using trained riders, monthly incentives, and prioritized inter-LGA transport to improve detection. The intervention aligned with Nigeria's TB Plan, targeting strengthened specimen networks to bridge the diagnostic gap.
Intervention or response: A retrospective analysis (2022-2024) was conducted across all 44 LGAs in Kano state to assess TB case identification and sample movement data. In collaboration with the State TB Program (STBLCP) and Global Fund support, the intervention included; training 786 sample movers from DOTs clinics on biosafety, sample packaging and digital tracking; transitioning to performance-based monthly incentives; and stratifying by intra- and inter-LGA movement. Data were analyzed for trends in presumptive TB evaluations, case yield, and turnaround time.
Results/Impact: Following the intervention, presumptive TB evaluations rose from 326,128 (2022) to 462,696 (2024)—a 42% cumulative increase (annual average: +19.4%). TB case detection surged from 17,939 (2022) to 36,738 (2024) (+105%; p<0.01), with the high yields in LGAs receiving monthly incentives. Turnaround time plummeted from 14 to 3 days (78% reduction), exceeding the WHO target of <7 days for DR-TB diagnostics.

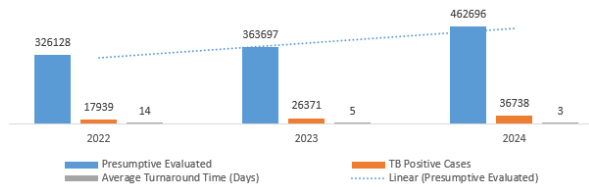

Figure. Three years trend showcasing sample movement and case identification data from 2022 to 2024.

Conclusions: Optimizing sample movement logistics with trained riders and tailored incentives significantly improved TB case detection and reduced diagnostic delays in Kano State, particularly in hard-to-reach areas. This model addresses a critical health system barrier identified in the WHO's 2023–2027 TB Strategy and Nigeria's UHC agenda. To sustain gains, we recommend: scaling the incentive-based transport system nationally, integrating GPS tracking for real-time monitoring, and deploying decentralized molecular platforms in priority LGAs.

OA18-276-20 Scaling-up and optimization of laboratories for diagnosing drug-resistant TB in Uttar Pradesh, India

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Background and challenges to implementation: While molecular WHO recommended rapid diagnostics (mWRD) detects rifampicin resistance, identifying mono-resistance to isoniazid or second-line fluoroquinolones mandates testing with Line Probe Assays (LPA) and liquid culture and drug sensitivity testing (L-CDST). This aids clinical decision-making for individualising DR-TB treatment, enhances patient outcomes, and helps reduce transmission.
Despite the presence of seven LPA labs in Uttar Pradesh, LPA testing coverage among MTB detected samples and utilization remained suboptimal. This highlighted the need to scale-up the LPA and improve laboratory capacity utilization.
Intervention or response: India Health Action Trust (IHAT) under the Gates Foundation Diagnostic Network Optimization Project collaborated with the State TB Cell, Lucknow and intermediate reference laboratories. IHAT conducted laboratory assessments, identified gaps between testing demand and capacity, standardized quality assurance protocols, optimized sample referral systems, streamlined logistics, and provided on-site training, supervision, and monitoring.
This collaborative approach enabled the operationalization of new LPA labs and enhanced the utilization of existing ones.
Results/Impact: The baseline assessment in 2023 revealed that LPA testing capacity met only one-third of the actual demand. IHAT interventions led to over 107,000 tests conducted in 2024, double the 48,730 tests in 2023.
Similarly, L-CDST testing increased from 33,728 tests in 2023 to 68,861 in 2024. Three new LPA labs became operational in 2024, with two more expected by mid-2025.
Conclusions: This initiative demonstrated that comprehensive assessments, combined with collaborative, multi-pronged strategies to address key gaps, can significantly enhance DR-TB diagnostic capacity and utilization, thereby strengthening overall DR-TB diagnostic services.

OA18-277-20 Transforming primary healthcare services through strategic mentorship approaches in Machakos County, Kenya

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Background and challenges to implementation: At the Primary HealthCare (PHC) level, health services depend on accurate, timely, and reliable data to support evidence-based decision-making. However, Community Health Promoters (CHPs) often lack the technical capacity to effectively utilize data for program improvement. To address this gap, in October 2022, the Center for Medical Mobilization Board (CMMB), with support from the Global Fund through Amref, implemented the Kenya Quality Model for Health (KQMH) in Machakos County, Kenya. The initiative aimed to strengthen data understanding and promote its application in generating informed community health solutions.
Intervention or response: Beginning October 2023, ten Community Health Units (CHUs) received structured mentorship to reinforce the KQMH model. The mentorship targeted Work Improvement Teams (WITs), each comprising nine members: one Community Health Assistant, three CHPs, one facility board member, one healthcare provider, and three community representatives—including an adolescent, a person with a disability (PWD), and a community health committee member. Using data from their linked health facilities, WITs assessed performance across key indicators, identified the lowest-performing areas through participatory voting, and implemented targeted interventions using the Plan-Do-Study-Act (PDSA) cycle.
To support effective implementation, CMMB and the county health management teams introduced quarterly mentorship visits. These sessions included one-on-one engagements, review of records, and assessment of usages of tools such as the PDSA cycle and fishbone diagrams—guided by standard mentorship questions. The results were logged online using the Log Alto tool.
While initial implementation in October 2022 showed limited progress, the mentorship sessions introduced in October 2023 triggered steady quarterly improvements in data use and WIT performance.
Results/Impact: Between October 2023 and June 2024, WITs showed consistent improvement, with average performance scores rising gradually from 55% to 75%, and reaching 84% by June 2024.
Conclusions: Mentorship, when combined with community participation and data-driven strategies, is a powerful catalyst for transforming PHC.

OA19 It's all about the money: Optimising TB care

OA19-278-20 TBI tests for contact screening in Brazil: A cost-effectiveness analysis

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Background: Tuberculosis infection (TBI) testing is recommended in Brazil for household contacts (HHC) of all ages. However, recurring shortages of purified protein derivative and the restricted indication of interferon-gamma release assays (IGRAs)—limited to people living with HIV and children aged 2–10 years—have constrained diagnostic coverage. The World Health Organization recently recommended three new tuberculosis (TB) antigen-based skin tests (TBSTs) - Diaskintest®, C-TST®, Cy-TB® - for TBI diagnosis.
Given the elevated risk of TBI among HHC, we assessed the cost-effectiveness TBSTs and of QuantiFERON-TB Plus® (QFT-Plus®) in comparison to the tuberculin skin test (TST) in Brazil.
Design/Methods: We developed a state-transition Markov model simulating four hypothetical cohorts of 10,000 HIV-negative HHCs across distinct age groups (3 months to 4 years, 5-9 years, 10-14 years, and 15 or older) over five annual cycles. The model evaluated testing and TB preventive treatment from the Brazilian public health system perspective.
Effectiveness estimates were derived from systematic reviews. Cost data were obtained from the Brazilian government (TST and QFT-Plus®) and from manufacturers (TBST). We calculated the incremental cost-effectiveness ratio (ICER) per TB case averted.

Age group	Strategy	Cost	Incremental cost	TB cases avoided	Incremental TB cases avoided	ICER	C/E
3 months to 4 years old	TST	508,976	Reference	151	Reference	Reference	3,375
	QFT-Plus®	615,157	106,182	154	3	35,810	4,001
	Cy-TB®	327,401	-181,575	124	-26	6,854	2,634
5 to 9 years old	TST	677,911	Reference	223	Reference	Reference	3,038
	Cy-TB®	396,791	-281,121	180	-43	6,547	2,202
10 to 14 years old	TST	336,931	Reference	213	Reference	Reference	1,579
	Cy-TB®	235,588	-101,343	175	-38	2,658	1,345
15 years old or more	TST	584,024	Reference	889	Reference	Reference	657
	Diaskintest®	517,481	-66,544	932	43	-1,535	555

Results: TBSTs demonstrated similar accuracy to QFT-Plus® and higher specificity than TST. All TBSTs were less costly and cost-saving across all age groups when compared to both TST and QFT-Plus®. Cy-Tb® was the most cost-saving, followed by Diaskintest® and C-TST®.
Conclusions: The adoption of TBSTs for screening HHCs in the Brazilian public health system would be a cost-saving strategy. Because these tests require the same infrastructure and human resources skills as TST, the tests could be readily implemented.

OA19-279-20 Improving resource allocation for TB programmes: A mechanistic cost function approach for efficient priority setting

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Background: TB services in LMICs are primarily delivered by primary care providers, offering a low-cost, versatile platform that can achieve efficiency gains through task shifting, decentralization, and outreach. However, the costs of these services vary significantly by platform capacity, scale, scope, and implementation efficiency. When integrating or expanding services, these factors are crucial in determining the cost of delivery. Accurate cost estimation for services at scale remains a significant challenge. Current costing models often assume constant marginal costs, a linear approach that fails to capture economies of scale and scope. This limitation hinders decision-making, as traditional models overlook the complexities of varying unit costs, especially when scaling TB interventions in resource-constrained settings.
Design/Methods: This research, part of the CAPTURE project, followed a three-step approach. First, a review and collection of available data from costing initiatives like Integra and South Africa's TB Think Tank were conducted. Second, a context-specific cost function framework was developed based on relevant literature, allowing for the specification of fixed and variable costs and enabling investments to address capacity constraints. In the third step, the cost model was parameterized and tested using the Integra dataset to predict delivery costs across facilities.
Results: The cost function provided more accurate estimates of costs at scale for TB programs compared to traditional methods. By accounting for economies of scale and scope, the model generated improved cost estimates for integrating and expanding TB interventions within primary care platforms. These results were summarized into three use cases, highlighting the model's potential for guiding cost-effective decisions in resource-constrained settings.
Conclusions: This study developed a robust mechanistic cost model for estimating TB service costs at scale, addressing local capacity constraints. The model and data collection tool support allocative efficiency analyses, improving decision-making for scaling interventions and optimizing resource use in primary care systems.

OA19-280-20 Cost-effectiveness of utilising CAD in an active case finding community screening programme to detect TB in Tamil Nadu, India

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Background: The Global Tuberculosis Report 2024 reveals that 87% of the global TB burden is concentrated in 30 high-TB-burden countries, with India accounting for 26% of estimated cases worldwide. India represents 16% of the global gap between TB incidence and diagnosed cases, highlighting the urgent need to enhance case detection and treatment coverage.
Design/Methods: A cost analysis was conducted for two modes of active TB case finding carried out in 10 districts of Tamil Nadu, India, comparing two TB screening approaches. Five districts implemented AI-aided screening, while the other five used conventional X-ray screening methods.
This study analyzed two components of the program:
a. Patient diagnostic path (PDP), which estimated the cost of finding one patient with sputum-positive TB in both screening methods, and;
b. Clinical care path (CCP), which estimated the Quality Adjusted Life Years (QALY) gained after treatment completion.

Districts	Population Screened	Patient Diagnostic Path Cost	Clinical Care Path Cost	Total Cost	Screening Cost per Patient	Screening Cost per 1000 Patients	Cost to find one patient sputum-positive-TB
AI-aided Screening							
Tirunelveli	15129	$ 64,852.16	$ 3,880.88	$ 68,733.04			
Tiruchirapalli	14861	$ 47,820.80	$ 4,376.32	$ 52,197.12			
Salem	12922	$ 44,350.81	$ 7,514.05	$ 51,864.87	$ 4.13	$ 4,131.36	$ 709.77
Vellore	11634	$ 47,289.36	$ 2,312.02	$ 49,601.38			
Kanchipuram	9536	$ 60,432.52	$ 2,146.87	$ 62,579.40			
Total	64082	$ 264,745.66	$ 20,230.14	$ 284,975.80			
Conventional Screening							
Viluppuram	12938	$ 47,740.83	$ 825.72	$ 48,566.55			
Coimbatore	5521	$ 48,894.97	$ 743.15	$ 49,638.12			
Madurai	7672	$ 25,820.98	$ 2,642.30	$ 28,463.29	$ 4.69	$ 4,688.41	$ 1,287.88
Cuddalore	9324	$ 37,015.04	$ 825.72	$ 37,840.76			
Tirupur	9320	$ 50,451.91	$ 1,238.58	$ 51,690.49			
Total	44775	$ 209,923.74	$ 6,275.47	$ 216,199.21			

Study Setting	Population Screened	Total TB Cases Detected	Patients Cured	Total QALYs Gained	Cost per QALY gained (₹)	CET for India	ICER
AI-aided Screening	64082	373	245	1445.72	$ 189.28	$495.42	$60.18
Conventional Screening	44775	163	76	432.79	$ 491.43		

Table.

Results: The study screened 108,857 individuals, with 44,775 examined through conventional methods and 64,082 using AI-assisted screening. The AI-assisted approach demonstrated significant improvements in costs, with the cost per patient screened reduced by 11.94% from $ 4.69 to $ 4.13 and the cost to find one patient with sputum-positive TB reduced by 44.88% from $ 1,287.88

to $ 709.77. There was a significant increase in the net QALYs, amounting to 234.05% (1,445.72 versus 432.79). The incremental cost-effectiveness ratio (ICER) was $60.2 per additional QALY gained, which is 87.85% lower than India's cost-effectiveness threshold (CET) of $495.42.
Conclusions: This economic evaluation provides compelling evidence that AI-assisted TB screening is cost-effective for case detection in resource-limited settings. The integration of artificial intelligence into TB screening programs demonstrated significant advantages over conventional methods, offering a promising strategy to address the substantial TB burden in high-prevalence regions.

OA19-281-20 Impact and cost-effectiveness of implementing household contact tracing, including TB preventive treatment in Nepal: A model-based analysis

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Background: The burden of tuberculosis (TB) remains unacceptably high globally, and it is increasingly recognized that preventive treatment should be integral in fighting TB, even in high-burden settings like Nepal. To scale up preventive treatment, high-quality, local evidence of feasibility and impact is urgently needed.
Design/Methods: We collected data on the costs and yields of implementing three months of isoniazid and rifapentine (3HP) to treat latent TB infection (LTBI), including ruling out and treating TB disease, among adult household contact persons from a pilot study conducted in two districts of Nepal (Chitwan and Pyuthan) in 2022. We developed and calibrated mathematical models representing each district and estimated the number of TB episodes and deaths averted by the intervention during 2023—2042. By combining net discounted costs and discounted impact, we estimated incremental cost-effectiveness of the intervention (compared to no intervention) from a health system perspective as costs (2022 USD) per disability-adjusted life-year (DALY) averted.
Results: The intervention screened 1711 adult household contact persons for TB and LTBI and treated 500 individuals for LTBI, achieving 98% 3HP acceptance and 95% completion at 150 USD per contact person treated (including drug and test procurement and implementation costs). Including the impact of treating TB disease, the intervention was projected to avert 179 disease episodes and 27 deaths during 2023-2042, or 10.5 episodes and 1.5 deaths averted per 100 contact persons screened. The incremental cost-effectiveness of the intervention was 31 USD (14 – 60) and 71 USD (45 – 112) per DALY averted in Chitwan and Pyuthan, respectively, well below Nepal's per-capita gross domestic product.

	Cost in 2022 figures (95% Uncertainty Interval)			Epidemiological Impact (95% Uncertainty Interval)			Cost-effectiveness (95% Uncertainty Interval)
District	Total Cost of Intervention	Estimated future cost savings (associated with TB treatment)	Net Cost	TB episodes averted	TB deaths averted	Discounted estimated DALYs averted	Cost per DALY averted
Chitwan	$39,441	$25,830 (18586 - 31531)	$13611 (7910 - 20855)	113 (80 – 141)	17 (12 – 25)	447 (326 - 601)	31 (14 - 60)
Pyuthan	$33,013	$15,132 (11249 - 18794)	$17,838 (14219 - 21764)	66 (48 – 82)	10 (7 – 14)	252 (186 - 346)	71 (45 - 112)
Combined	$73,829	$40,962 (23834 - 50325)	$31,2491 (22128 - 42619)	179 (128 – 226)	27 (19 – 39)	700 (511 - 946)	51 (29 - 85)

Conclusions: Screening and treating household contact persons for both TB and LTBI can be successfully implemented in both rural and urban settings in a cost-effective manner and should be prioritized to reduce the TB burden in Nepal and similar high-burden countries.

OA19-282-20 Cost-effectiveness of replacing 6-9H isoniazid monotherapy with 3HP for TB preventive therapy in Brazil: A national and sub-national analysis

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Background: Tuberculosis (TB) remains a major public health challenge in Brazil, with an estimated economic burden of $1.3 billion between 2015-2022. TB preventive therapy (TPT) is essential for reducing transmission and economic burden, yet evidence on the cost-effectiveness of different regimens in Brazil remains limited.

Design/Methods: We conducted a cost-effectiveness analysis comparing the shortened 3HP regimen (three months of weekly isoniazid + rifapentine) to traditional 6–9 months of daily isoniazid (6-9H). Using real-world national and state-level surveillance data from Brazil's TPT notification system, we assessed treatment completion rates from individuals initiating TPT between 2019–2023. Cost and TB-related disability-adjusted life years (DALYs) were modelled using counterfactual historical scenarios (2019–2023) and future coverage scenarios (2024–2030), assuming 75% or 100% 3HP prescription coverage. Probabilistic sensitivity analyses (PSA) assessed robustness of results.

Results: Among 126,802 notified prescriptions, 23% received the 3HP regimen, demonstrating higher completion rates (88.8%) compared to 6-9H (76.6%). Economic modelling with PSA showed scaling up 3HP consistently reduced overall healthcare costs and TB-related DALYs, resulting in negative incremental cost-effectiveness ratios (ICERs) (Figure 1). Under universal (100%) adoption of 3HP, estimated net monetary benefits reached $35.8 million [95% CI: $17.8–$58.8 million] for the counterfactual period and $50.3 million [$16.2–$94.2 million] for future scenarios. Subnational analyses indicated that regions with high TB burden but low current 3HP usage, including the state of São Paulo, would achieve significant economic gains by increasing 3HP coverage.

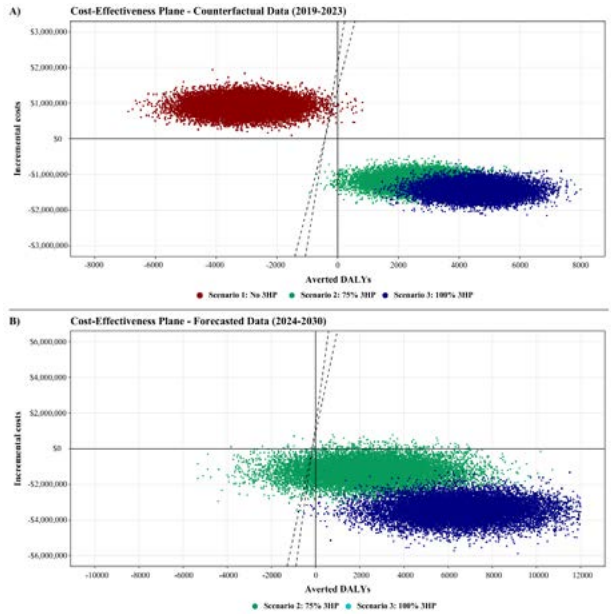

Figure 1. Cost-effectiveness planes comparing scenarios increasing 3HP coverage

Conclusions: Transitioning from traditional isoniazid monotherapy (6-9H) to the shorter 3HP regimen would improve treatment completion rates, while also offering substantial economic savings and reductions in TB-burden across Brazil. This cost-effective strategy presents an impactful opportunity for national and state health policymakers to optimize limited resources, accelerate progress toward TB elimination, and alleviate economic strain on healthcare systems.

OA19-283-20 Cost effectiveness of 1HP vs 3HP in HIV-negative contact persons with latent TB infection in Brazil

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Background: The World Health Organisation recommends short-course tuberculosis preventive treatment with either 1 month of daily isoniazid and rifapentine (1HP) or 3 months of weekly isoniazid and rifapentine (3HP). The UltraCurto study randomized household contact persons without HIV in Brazil to either 3HP or 1HP and found high adherence to both regimens and more safety events with 1HP than 3HP. Evidence of cost-effectiveness has been limited.
Design/Methods: A Markov model using health state transitions was developed to simulate disease progression and treatment over a 20-year horizon. The model estimated the incremental costs and effects of 1HP vs 3HP in a cohort of 500 simulated patients. The primary outcome was the incremental cost-effectiveness ratio (ICER), measured in 2022 dollars ($) per disability-adjusted life year (DALY) averted. 1HP and 3HP were also compared against six to nine months of isoniazid and a baseline of no treatment. Drug costs were obtained from the GDF 2024 catalogue. Other costs were gathered from a societal perspective incorporating both clinic expenses, time-and-motion data and scientific literature.
Results:

Treatment	Costs ($)	DALYs	Incremental Cost ($)*	Incremental Daly's Averted	ICER	Completion Rate (%)	Dominance Status
No LTBI Treatment	$347,115	3848	$153,371	1492.2	$103	100.0%	1HP Dominant
1HP	$193,744	2355	n/a	n/a	n/a	89.6%	n/a
3HP	$207,067	2359	$13,323	3.7	$3,563	84.1%	1HP Dominant
6-9H	$282,641	2474	$88,897	119	$747	69.0%	1HP Dominant

With rifapentine (300mg) tablets priced at $0.34 and isoniazid (300mg) tablets at $0.02, 1HP was estimated to be cost-effective relative to 3HP, with a, incremental cost per DALY averted of $3,563. 1HP costs were lower, largely driven by fewer clinical visits for patients versus 3HP. The initial cost per patient for 1HP was $67.45 lower than 3HP, at $98.75 for 1HP compared to $166.19 for 3HP.
Conclusions: Due to its shorter regimen duration and similar safety events, 1HP presents a more cost-effective alternative to 3HP for adults exposed to TB in their homes. Combined with the UltraCurto safety results, these findings support the wider adoption of 1HP for TB prevention in the adult population. Future research should explore safety and cost-effectiveness of 1HP in other populations including children and pregnant and lactating persons.

OA19-284-20 Cost and impact of decentralising TB testing: Price thresholds for molecular instruments in high-TB-burden settings

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Background: Despite progress in reducing global tuberculosis incidence, ongoing funding disruptions threaten to reverse gains. Timely, accurate diagnosis integrated with rapid treatment is critical to reducing morbidity, mortality, and transmission—but remains costly and logistically challenging, particularly for decentralized approaches. As global health budgets tighten, identifying the instrument price at which TB diagnostics can be cost-effectively decentralised is crucial to inform scale-up decisions.
Design/Methods: We developed a probabilistic patient pathway model to assess the cost-effectiveness of decentralising TB testing across primary healthcare facilities in high-burden settings. We modelled a distribution of facilities (testing volumes following a Pareto distribution) and varied average testing density across the system (low, medium, high). We assigned ≥1 molecular instrument per facility, matching instrument size to volume (using GeneXpert instrument pricing for baseline; assuming $8 consumable cost/test). Given the documented increase in testing volume with decentralization, we evaluated three scenarios: no increase, partial (+45% increase), and full (+90%), based on recent literature. We included the effects of instrument downtime and calculated the maximum instrument (including warranty) prices at which fully decentralised testing would be considered cost-effective at a $500 per DALY averted threshold.
Results: Decentralisation with increased testing averted up to 23% more DALYs than centralized testing but was not cost-effective at current instrument prices. For full decentralisation to meet the $500/DALY threshold, maxi-

mum viable instrument prices ranged from $0 (no testing increase) to $106–$1,618 (full testing increase, low- to high-density settings) (**Figure**). These price thresholds increased when no instrument downtime can be assured, reaching $6,219-$9,358/instrument in high-density settings.

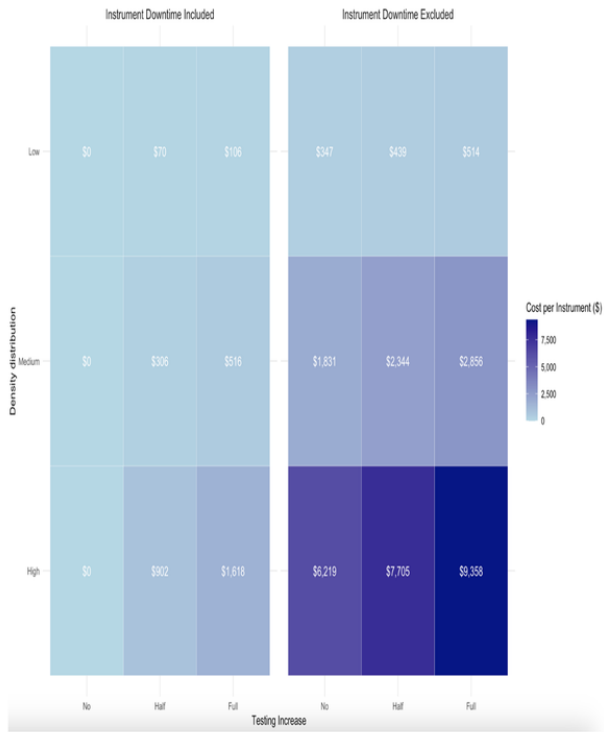

Figure. Instrument and warranty prices to achieve cost-effectiveness at $500 per DALY averted, with and without instrument downtime. The left panel includes 30-day downtime for decentralized testing and the right panel excludes instrument downtime. Results are stratified by the facility density distributions and testing increase (no, partial, and full increase).

Conclusions: At current prices, decentralised molecular TB testing is unlikely to be cost-effective, even with improved uptake. However, meaningful reductions in instrument costs could make decentralisation viable. As countries face tighter budgets, clear price targets for cost-effectiveness can help guide procurement and investment decisions in TB diagnostics.

OA19-285-20 Evaluating the economic impact of low-to mid-throughput multi-disease molecular testing with Cobas MTB and MTB-RIF/INH assays: A case study in the Philippines

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Background: Tuberculosis (TB) remains prevalent in the Philippines, posing a significant burden.[1] This study assessed the economic and clinical impact of introducing a low-to mid-throughput multi-disease platform (Cobas® 5800 system) with the Cobas MTB (MTB [*Mycobacterium tuberculosis*]) and Cobas MTB-RIF/INH (MTB-RIF/INH [RIF: rifampicin; INH: isoniazid]) assays to complement the current low-throughput near point-of-care system (Xpert MTB-RIF assay) in the Philippines.
[1] Philippines National Tuberculosis Report, 2022.
Design/Methods: A decision-analytic model was developed to compare a low-to mid-throughput multi-disease testing approach (intervention) to the standard near point-of-care low-throughput TB testing approach (comparator). Key model inputs included: TB incidence and distribution of drug-resistance status, performance of different diagnostic approaches, costs, survival and health-related quality of life. The model population was TB-testing eligible adults. Various scenarios to evaluate cost-effectiveness, return on investment (ROI), and key factors driving the results were conducted. A societal perspective was used. Sensitivity analysis was performed.
Results: From an early investigation of the modelled scenarios (one set of scenarios), introducing a low-to mid-throughput multi-disease testing provides greater clinical benefits, with an increase of 60–371 life years gained, or 54–334 quality-adjusted life years (QALYs) gained, or 120–737 disability-adjusted life years (DALY) averted per 100,000 tested population. The incremental cost per tested person ranged from −$5.10 to +$5.14, with incremental cost-effectiveness ratio between intervention dominant and $4,349/QALY gained, or $1943/DALY averted, meeting the cost-effectiveness threshold for the Philippines. The ROI was between 37% and 262%. Key factors driving the results include test cost, diagnostic performance, proportion of mono-INH resistance and improvement in survival if receiving the optimal treatments.

Conclusions: Optimizing the TB diagnostic network with low-to mid-throughput multi-disease testing in the Philippines has high potential for cost-effectiveness, offering cost efficiency, clinical benefits, and a strong return on investment to improve patient care and outcomes.

OA19-286-20 An extended cost-effectiveness and benefit incidence analysis of decentralised TB diagnostic testing with Molbio Truenat MTB/RIF vs. hub-and-spoke GeneXpert MTB/RIF in Mozambique and Tanzania

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Background: In low- and middle-income countries (LMICs), tuberculosis (TB) remains a leading cause of death. Timely diagnosis is essential, and decentralized testing strategies have shown promise in improving access. While their effectiveness is well-established, national policy decisions also require evidence on affordability and equity impacts.
This study synthesizes economic and equity findings from a multicentre cluster-randomized controlled trial (cRCT) in Mozambique and Tanzania, evaluating a point-of-care (POC) TB diagnostic strategy using the Molbio Truenat MTB/RIF platform compared to the hub-and-spoke Xpert MTB/RIF Ultra model.
Design/Methods: Economic data were collected as part of the TB-CAPT Core cRCT, including implementation costs and participants' out-of-pocket (OOP) expenses. An Extended Cost-Effectiveness Analysis (ECEA) and Distributional Cost-Effectiveness Analysis (DCEA) were conducted to assess incremental costs and TB treatment initiation within seven and sixty days, stratified by socioeconomic status (SES). Benefit incidence analysis was used to estimate public subsidies across SES groups. Equity analysis was based on asset indices developed using Multiple Correspondence Analysis. Concentration curves and indices were used to assess pro-poor distribution.
Results: Average OOP costs were significantly lower in the intervention group (USD 8.82 vs. USD 13.61). Participants in higher SES groups saw greater cost savings, while poorer groups experienced earlier treatment initiation. Treatment initiation within seven days was higher in the poorest quintiles in both countries, and the intervention led to over 1.5 times greater treatment initiation compared to the control.
The societal cost per treatment initiated was higher in the intervention arm, the benefits were more equitably distributed, favouring the poorest groups.
Conclusions: Decentralized POC TB testing using Truenat is both cost-saving for patients and more effective in increasing treatment initiation. The intervention demonstrated a pro-poor distribution of benefits, supporting its potential to improve access and equity in TB care across LMICs.

OA19-287-20 Is universal health coverage the solution to protecting TB-affected households from financial and socio-economic burdens: A cross-sectional cost study in South Korea

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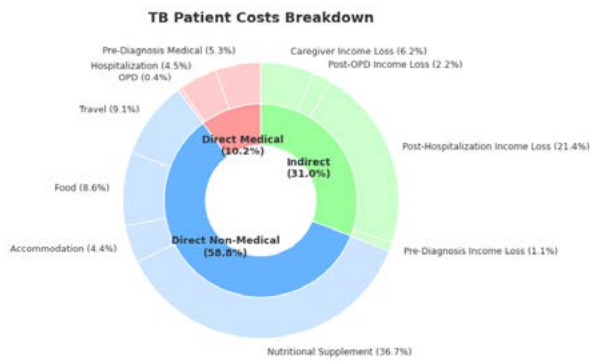
Background: Universal health coverage (UHC) and zero catastrophic costs among tuberculosis (TB)-affected households are core goals of the WHO End TB Strategy, yet evidence from countries with national health insurance systems remains limited. This study aimed to generate the South Korean national estimate of the catastrophic

cost levels in households affected by TB and to identify the patient cost drivers in a high-income setting with a declining TB burden.

Design/Methods: We conducted a cross-sectional study across five public-private (PPM) healthcare institutions in South Korea from August 2024 to February 2025. A total of 133 adult DS-TB patients were recruited using quota sampling based on age and gender distribution from 2023 national TB notification data.

We modified the survey questionnaire based on the WHO TB Patient Cost Survey and the Korea Health Panel Survey to reflect the local healthcare context. Self-reported TB-related costs were categorized as direct medical, non-medical, and indirect costs. Household income-stratified analysis was performed across five groups at 2 million KRW intervals.

Results: The proportion of TB-affected households incurring catastrophic costs was estimated at 41.4% (95% CI 32.4-49.4). Major cost drivers included direct non-medical costs (58.8%) (e.g., nutrition supplements, travel, food), indirect costs (31.0%) (i.e. income loss), followed by direct medical costs (10.2%). Stratified analysis by household income (HHI) revealed a clear gradient in the proportion of catastrophic cost, ranging from 78.9% in the lowest HHI group to 5.0% in the highest, indicating substantial disparities by income.



Conclusions: Despite having high national health insurance coverage, households affected by TB in South Korea continued to face significant financial and socio-economic burdens. These findings reveal critical gaps in TB-sensitive social protection, particularly for non-medical and income-related expenses, and highlight the need to expand personalized protection strategies beyond medical care cost (e.g., paid sick leave and sickness benefits) to further protect TB-affected households.

OA20 Prevalence surveys (TB disease and M. TB infection) and transmission studies

OA20-288-20 TB infection by age groups in Mongolia

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Background: Mongolia is one of the 30 countries with a high TB burden an estimated incidence rate of 491 per 100,000 population. This study aimed to determine the prevalence of tuberculosis infection among relatively healthy individuals residing in crowded metropolitan settings.

Design/Methods: A cross-sectional study was conducted between June 2024 and March 2025 at the National Center for Communicable Diseases in Ulaanbaatar, Mongolia. Eligibility criteria included being relatively healthy, asymptomatic for TB, with no history of TB treatment or known contact with TB cases. Participants completed questionnaires, and tested QuantiFERON-TB Gold Plus (QFT-Plus) assay in whole blood. Python (3.8.8) and other libraries were utilized to analyze the dataset.

Results: A total of 766 individuals were included in the analysis. The mean age was 38.2 years (SD=15.7), and the median age was 36 years, with an age range from 10 to 87 year. Of the participants, 47.1% (n=361) were female and 52.9% (n=405) were male. The weighted prevalence of TB infection was estimated at 33.4% (95% CI: 30.1%–36.8%). The QFT-plus positivity rates were 10-19 (7.9%, 95% CI: 2.3%- 13.6%), 20-29 (27.5%), 30-39 (37.9%), 40-49 (42.1%), 50-59 (36.7%), 60< (46.1%, 95% CI: 35.7%-56.4%) respectively, by age group. The QFT-plus positivity rates increase with age across both genders, peaking in the 60< group (p-0.000). Females in age groups 40–59 show slightly higher positive rates than males, whereas the 30–39 male group has the highest observed rate (41.6%, 95% CI: 30.6 to 52.6%) among males. However, gender was not significantly associated with positivity (p = 0.652).

Conclusions: This study identified a TB infection prevalence of 33.4%. Age was significantly associated with higher TB infection rates, whereas gender was not a determining factor, indicating the decrease of active transmission in young ages and shift to a situation where TB from TB infection is predominant.

OA20-289-20 Prevalence and risk factors for tuberculin skin test positivity in Rwanda: A nationwide cross-sectional study

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Background: Latent tuberculosis infection (LTBI) affects nearly a quarter of the global population and represents a key obstacle to TB elimination. In Rwanda, while the burden of active TB has decreased significantly, the prevalence and risk factors for LTBI remain poorly characterized. The Tuberculin Skin Test (TST) is commonly used for LTBI diagnosis in Rwanda, yet data on its positivity TST associated factors are scarce.
This study aimed to estimate the prevalence of TST positivity and identify its associated risk factors nationwide.
Design/Methods: A population-based cross-sectional survey was conducted across 90 randomly selected villages in Rwanda, enrolling individuals aged five years and older through systematic random sampling. Data were collected electronically using REDCap and included demographic, clinical, and behavioral characteristics. TST positivity was defined as an induration ≥10 mm.
Descriptive statistics were used to describe the study population, and logistic regression analyses were performed to identify factors associated with TST positivity. Ethical approval was obtained from the Rwanda National Ethics Committee.
Results: Among 1,350 participants, the overall TST positivity rate was 22%. TST positivity was significantly associated with male gender (AOR: 2.11, 95% CI: 1.58–2.83), increasing age (AOR for 55+: 8.9, 95% CI: 2.70–29.40), larger household size (AOR: 1.44, 95% CI: 1.07–1.95), previous smoking (AOR: 1.81, 95% CI: 1.11–2.97), history of TB (AOR: 8.8, 95% CI: 2.19–35.45), chronic disease (AOR: 2.17, 95% CI: 1.27–3.74), and past imprisonment (AOR: 2.83, 95% CI: 1.46–5.51).
Conclusions: This study provides the first national estimate of TST positivity in Rwanda and highlights key demographic, behavioral, and clinical risk factors. These findings are critical for informing LTBI screening strategies and optimizing tuberculosis preventive therapy (TPT) to support Rwanda's End TB goals by 2035.

OA20-290-20 Early results of the first subnational TB prevalence survey in Ho Chi Minh City, Viet Nam

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Background: Tuberculosis prevalence surveys (TBPS) are critical epidemiological surveillance tools which National TB Programs (NTP) use to inform national strategies. However, they are costly and complex to implement, resulting in only 43 national TBPS being conducted globally over the past 23 years. With support from TB REACH, the NTP, IRDVN and Friends for International TB Relief conducted a TBPS in Ho Chi Minh City, Vietnam's highest TB burden province, accounting for 20% of national treatment notifications.
Design/Methods: The survey was planned between 11/2023-05/2024 and implemented from 06-08/2024. The sample size was 25,131 in 74 clusters based on Probability-Proportional-to-Size sampling, a between-cluster variation of 1.19, and a relative precision of 25%. Cluster residents aged 15+ years were mapped and mobilized to present for verbal and chest X-ray screening. Persons with symptoms per WHO 4-symptom screen, TB in the last 2 years, or exhibiting radiographic abnormalities provided two spot sputum specimens 30-minutes apart for testing with the Xpert MTB/RIF Ultra assay (Ultra). A third specimen was obtained post-hoc for confirmatory liquid culture for Ultra-positive participants.
Results: We screened 23,986 participants, with 2,239 (9.3%) undergoing double-Ultra testing. The weighted prevalence rate was 474/100,000 or 1.64x-2.02x of the latest national (235/100,000) and southern regional (289/100,000) prevalence rates when using only the Xpert MTB/RIF assay (Xpert). When Trace results are re-classified as negative and 2nd Ultra tests are dropped to approximate single Xpert testing, the weighted prevalence rate was 284/100,000 or 0.98x-1.2x the last national TBPS. The total subnational TBPS costed USD 288,206.
Conclusions: It is feasible to conduct a subnational TBPS that produces robust TB burden estimates within acceptable timeframes and costs. TBPS in subnational hotspots can be valuable surveillance tools to monitor progress towards ending TB. This methodology may also be considered to optimize the timelines and costs for national TBPS.

OA20-291-20 National TB Prevalence Survey in Nepal (2018–2019)

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Background: Tuberculosis (TB) remains a major public health challenge in Nepal, contributing significantly to morbidity and mortality despite longstanding control efforts. To address gaps in case detection and reporting, Nepal conducted its first national TB prevalence survey (2018–2019) among individuals aged ≥15 years.
This cross-sectional study aimed to estimate bacteriologically confirmed pulmonary TB prevalence, assess healthcare-seeking behaviors.
Design/Methods: Employing a multistage cluster sampling design stratified by terrain and urbanization, 99 clusters were selected via probability proportional to size. Participants underwent symptom screening and chest X-ray (CXR), with sputum samples analyzed using Xpert MTB/RIF and culture.
Data were analyzed using WHO-recommended methods, incorporating inverse probability weighting and multiple imputation for missing data.
Results: Of 93 085 enumerated individuals, 54 200 (92% of eligible participants) were surveyed. The prevalence of bacteriologically confirmed pulmonary TB among those aged 15 and above was 374.5 per 100 000. Prevalence was higher among males, older age groups, and in hill and terai regions. The P/N (prevalence-to-notification) ratio was 3.5, indicating underreporting.
Over 70% of TB cases were identified through CXR screening without symptoms, highlighting the importance of CXR as a screening tool. Health-seeking behavior analysis revealed that 39% of symptomatic individuals did not seek care, with barriers including financial constraints and lack of access.
Conclusions: The survey revealed a higher TB burden in Nepal than previously estimated, with significant underreporting and disparities in access to care.
The findings underscore the need for expanded use of sensitive diagnostic tools like CXR and Xpert MTB/RIF, improved health service accessibility, and targeted interventions for high-risk groups, including the elderly and those in hard-to-reach areas. Strengthening cross-border collaboration, engaging the private sector, and increasing investments in TB control are critical to achieving Nepal's End TB goals.

OA20-292-20 Cross-regional transmission of drug-resistant TB in Namibia: Insights from genomic surveillance

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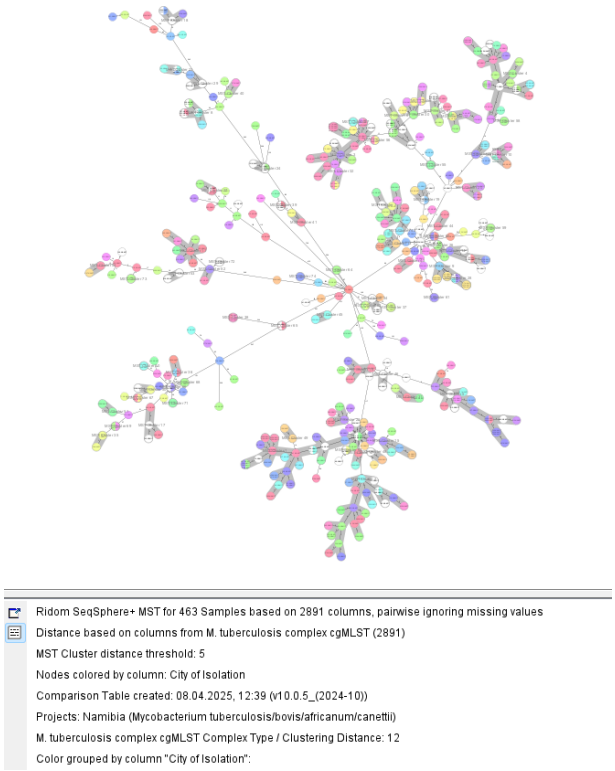
Background: Drug-resistant tuberculosis (DR-TB) poses a major public health challenge to ongoing efforts to control and eradicate tuberculosis (TB) in Namibia, a country with a high TB burden. Identifying and understanding the factors contributing to DR-TB transmission is crucial.
This study examines DR-TB transmission patterns across Namibia, highlighting the role of regional mobility and interconnected outbreaks.
Design/Methods: Whole Genome Sequencing (WGS) was performed to characterize 463 *Mycobacterium tuberculosis* complex (Mtbc) clinical strains collected between 2016 to 2023 from patients who had documented rifampicin resistance based on Xpert MTB/RIF in all regions of Namibia.
Phylogenetic strain classifications, genomic resistance predictions, and core-genome multi-locus sequence typing analysis were conducted using SeqSphere (Ridom GmbH, Münster, Germany).
Cluster analysis was done using a threshold of 05 alleles, and the region of isolation was also examined to assess cross-regional transmission patterns.
Results: The MTBC population structure had the majority of the isolates classified as belonging to lineage 4 (L4; n=450), while 12 isolates belonged to lineage 2 (L2, Beijing), and the remaining one belonged to lineage 1 (L1).
The cluster rates were high, with 359 out of 463 isolates grouped into 74 clusters, ranging from 2 to 33 isolates. Of the MDR isolates/patients, 316/405 (78.0%) were clustered, 23/27 (85.2%) pre-XDR isolates, 8/9 (88.9%) XDR isolates, and 12/21 (57.14%) non-MDR Mtbc isolates were also clustered.
Eighteen out of the 74 clusters contained isolates from different regions. The largest cluster, consisting of 33 isolates, included isolates from 7/14 regions in Namibia, while the region with highest clustering rate was Otjozondjupa (87.5% (49/56)).



Conclusions: The high clustering rate and the presence of isolates from different regions within the same clusters suggest ongoing cross-regional transmission of DR-TB in Namibia, driven by human mobility. Further investigations are needed to understand the factors contributing to this transmission pattern and guide targeted interventions.

OA20-293-20 The role of prisons in the spread of TB over time in Lima, Peru

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Background: Prisons are recognized as high-risk environments for tuberculosis (TB) transmission, but their long-term impact on community transmission remains unclear. While previous studies show that TB strains are often shared between people with and without a history of incarceration—suggesting spillover from prisons into the community—no studies have quantified how widely these prison-related strains spread over time.

Design/Methods: We analyzed whole-genome sequencing data from two population-based TB cohorts conducted ten years apart in the same area of Lima, Peru. The first study (2009–2012) enrolled 4,500 newly diagnosed TB patients; the second (2020–2022) enrolled 2,000. We obtained Mycobacteria tuberculosis (Mtb) sequences from 3,567 (79%) patients in the earlier cohort and 1,765 (88%) in the later one. For each Mtb strain identified in the earlier cohort, we calculated how many genetically similar strains (≤5 single nucleotide polymorphisms) appeared in the later cohort. This "strain expansion indicator" reflects how widely each strain had spread over the decade.
We then used a Poisson generalized estimating equation to assess whether strains linked to incarceration—defined as those from individuals in the earlier cohort who had spent at least one day in prison within five years before their TB diagnosis—were more likely to expand, accounting for genetic relatedness between strains.
Results: Mtb strains from individuals with recent incarceration had a 1.45-fold increase (95% CI: 1.25–1.67) in genetically similar strains in the later cohort compared to strains from individuals without such a history.
Conclusions: Our findings suggest that prison-related TB strains contribute disproportionately to long-term community transmission. This underscores the need for targeted TB control strategies that address both transmission within prisons and the continued risk posed after release.

OA20-294-20 Population-wide TB screening in Kiribati: Preliminary results

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Background and challenges to implementation: Mass TB screening programmes are resource-intensive, but essential in high-burden settings to reduce transmission and support timely care. Evidence comparing different screening modalities in real-world contexts remains limited. Symptom-based screening misses many people, especially older adults and those with subclinical disease. Chest X-ray improves sensitivity but specificity is a concern, especially in people with previous TB.
Intervention or response: The PEARL protocol combined symptom screening, chest X-ray, and sputum Xpert testing in everyone older than 10 years of age, in South Tarawa, Kiribati. We evaluated screening yield and number needed to screen (NNS) by age group, comparing the full PEARL screening protocol (combined symptoms, chest X-ray and sputum testing) with hypothetical scenarios where only symptoms or X-ray formed the initial screening test.

Results/Impact: Screening and diagnostic outcomes for more than 10,000 participants in a high-transmission urban area were available for analysis. In total, 95 people with TB (888/100,000 population) were identified. Across all age groups, the full PEARL protocol achieved the highest overall yield (0.89%) and lowest NNS (113), compared to symptoms-only (0.21%; NNS = 482) and X-ray-only (0.76%; NNS = 132) screening scenarios. Yield increased markedly with age. Among adults ≥50 years, yield from X-ray alone was comparable to the full protocol. In younger age groups, the addition of mass sputum screening with GeneXpert improved detection over symptoms or X-ray alone.

		Symptom Only		X-ray (10+)		PEARL	
Age Group	N	Yield (%)	NNS	Yield (%)	NNS	Yield (%)	NNS
0-9	2,201	0.46	215.1	0.00	–	0.50	200.1
10-19	2,194	0.05	2,177.0	0.33	303.3	0.59	168.8
20-29	2,031	0.10	1,008.5	0.61	163.1	0.69	145.1
30-39	1,666	0.18	553.0	0.62	161.6	1.02	98.0
40-49	1,124	0.09	1,118.0	0.82	122.1	1.07	93.7
50-59	771	0.39	255.3	1.47	68.0	1.69	59.3
60-69	500	0.20	494.0	1.68	59.6	1.60	62.5
70-79	181	0.00	–	2.89	34.6	2.76	36.2
80+	34	2.94	34.0	6.06	16.5	5.88	17.0
Ages 10+	8,501	0.14	703.8	0.78	128.5	0.99	101.2
All	10,702	0.21	481.6	0.76	132.2	0.89	112.7

Conclusions: Comprehensive screening using digital X-ray and sputum Xpert can identify more people with TB earlier, in comparison to symptom-only approaches. Higher screening yield in older age cohorts with X-ray reflects a higher burden of disease and sputum collection difficulties. In younger age cohorts, there was an additional benefit from sputum screening. These real-world findings may guide future mass TB screening programmes.

OA20-295-20 Quantifying undetected TB in Ethiopia using a novel geospatial modelling approach

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Background: Tuberculosis (TB) is the leading infectious cause of death globally, with approximately three million cases remaining undetected, thereby contributing to community transmission. Understanding the spatial distribution of undetected TB in high-burden settings is critical for designing and implementing geographically targeted interventions for early detection and control. This study presents the first estimates of numbers of undetected TB cases in Ethiopia at national and local levels.

Design/Methods: We employed a Bayesian geostatistical modelling framework, incorporating national TB prevalence survey and TB notification data together with climatic and environmental variables, to estimate the number of undetected TB cases at district and national levels. Spatial clustering of undetected TB cases was assessed using Moran's Index statistic and Local Indicator of Spatial Autocorrelation (LISA). A Bayesian Poisson regression model with conditional autoregressive (CAR) prior structure was developed to identify drivers of the clustering.

Results: We estimated a total of 51,041 undetected TB cases (95% CI: 50,599, 51,486) in Ethiopia, with the majority of these cases predicted in the Oromia region (20,440), Amhara region (9,614), and South Ethiopia region (6,061). Spatial clustering of undetected TB cases was observed in districts near international borders, including the Ethiopia-Somalia and Ethiopia-Kenya border regions, as well as in several districts of Southern Ethiopia. The number of undetected TB cases was negatively associated with the proportion of the population with good mass media exposure (Incidence rate ratio (IRR): 0.67 95% CI: 0.56, 0.80) and the proportion of the population with high wealth index (IRR: 0.73, 95% CI: 0.60, 0.90).

Conclusions: Our findings revealed a high burden of undetected TB in Ethiopia, with spatial clustering in border regions and areas with limited healthcare access. Targeted TB screening interventions to communities with low socioeconomic status along with improving mass media exposure in these regions, could significantly reduce the burden of undetected TB in Ethiopia.

OA20-296-20 Heterogeneity in *M. TB* immunoreactivity in a community-based survey of young children in Blantyre, Malawi

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Background: Tuberculosis (TB) has declined substantially over the past decades in many high-burden settings in sub-Saharan Africa, with transmission increasingly concentrating in vulnerable populations and spatial hotspots. Consequently, repeated disease prevalence surveys have become more expensive and less informative. Passive surveillance methodologies such as case notification rates (CNRs) have known bias due to healthcare access disparities. *Mycobacterium tuberculosis* (Mtb) immunoreactivity surveys may give insights into undiagnosed infectious TB burden, allowing monitoring of transmission and spatial targeting of interventions.

Design/Methods: We performed a community-based interferon gamma release assay (IGRA) survey in children aged 1-4 years in Blantyre, Malawi. Community-representative participants were recruited using novel convenience sampling in primary health clinics, alongside random household sampling guided by satellite imagery, and tested for Mtb immunoreactivity using QFT-Plus. We constructed hierarchical Bayesian logistic regression models for an outcome of positive QFT-Plus, with neighbourhood-level random effects.

Results: We recruited 1,545 children aged 1-4 years. Characteristics were broadly similar between participants recruited through clinic-based convenience sampling and conventional household sampling.

Overall, 102 (6.6%) had Mtb immunoreactivity, corresponding to an annual risk of TB infection (ARTI) of 2.7% (2.2-3.2%). Children in the poorest third of households were more likely to have Mtb immunoreactivity (8.7% vs 5.5%; AOR 1.60, 1.06-2.45). Mtb immunoreactivity was not associated with HIV exposure, malnutrition, household contact, neighbourhood HIV prevalence or population density.

There was substantial between-neighbourhood heterogeneity, with predicted neighbourhood ARTI ranging from 1.1% (0.3-2.4%) to 4.1% (1.7-8.3%)(Figure 1A). There was no association between neighbourhood CNR and ARTI(Figure 1B), suggesting that CNRs may not accurately reflect prevalence of undiagnosed infectious TB.

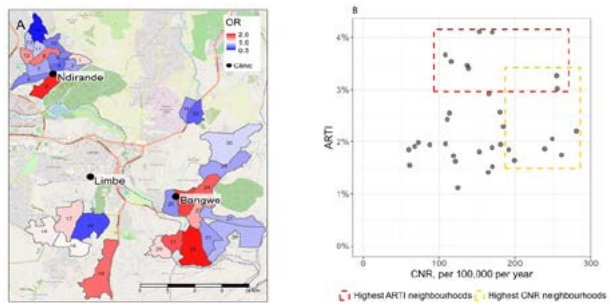

Figure 1
A. Neighbourhood-level odds ratios (OR) of Mtb immunoreactivity.
B. Relationship between neighbourhood-level annual risk of TB infection (ARTI) and case-notification rate (CNR). The highest quartile by each metric are highlighted, indicating those which might theoretically be prioritised for public health intervention.

Conclusions: Immunoreactivity surveillance in 1-4-year-olds using clinic-based convenience sampling provided valuable epidemiological insights in this Southern African urban setting. It has potential to identify children who may benefit from TB preventive therapy, and to allow prioritisation of groups and neighbourhoods for targeted public health intervention.

OA21 Breaking the TB poverty cycle: Tackling inequality, financial burden and policy gaps for people-powered solutions

OA21-297-20 Does TB research presented at The Union World Conference on Lung Health engage with the conditions of poverty, inequality and undernutrition experienced by TB-affected communities? An abstract review

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Background: Tuberculosis is fundamentally a disease of poverty, driven by and exacerbating financial hardship, inequality, and undernutrition. Despite their clear role in tuberculosis risk, these factors have not received proportional attention in modern tuberculosis research. Given the availability of effective, tuberculosis-protective poverty-focused interventions (e.g. social protection, nutritional support etc), we examined current trends in tuberculosis research engagement with poverty through a review of abstracts accepted at the 2024 UNION World Conference on Tuberculosis and Lung Disease (UNIONconf24).
Design/Methods: Abstracts were extracted using a Python script and those mentioning 'tuberculosis' and cognates were analysed in R. Word frequency analysis and the expert opinion of 3 reviewers assessing 40 randomly selected abstracts identified a list of 37 key poverty-related terms (e.g., inequality, income, undernutrition) which were used to mine abstract and titles for poverty-related abstracts. The proportions of abstracts using poverty and non-poverty-related language were further stratified by presentation type (oral, poster, late-breaker, etc) and geographical location of the first authors.
Results: Of the 1254 extracted abstracts, 95.9% of abstracts/titles (1204/1254) were tuberculosis-related, of which 819 (68.0%) contained no poverty-related terms. Amongst abstracts containing at least one poverty-related term (n=385), 167 (43.4%) included only a single usage, with the most frequent single-use terms being "nutrition" n=95; "stigma" n=81; "financ-" n=57 and "income" n=47. Differential terms between poverty and non-poverty abstracts not included in our initial word-mine were "LGBTQAI" n=23, "Self-help groups" n=18 and "Person-centred care" n=16. Poverty-related abstracts containing ≥2 unique poverty terms (n=131) were most common amongst poster presentations (13% (44/346)) and least common amongst TB-science (0% (0/14)) and late-breaker (3% (1/30)) sessions.

Figure 1. Wordclouds showing relative frequencies of distinctive terms that were most differential between poverty-related (right) and non-poverty related abstracts (left)

Conclusions: Research presented at UNIONconf24 acknowledges the relevance of poverty to tuberculosis, but the representation of studies that engage with poverty appears suboptimal. Future qualitative analyses could give deeper insights into the engagement of UNION research with poverty, equality, and undernutrition.

OA21-298-20 People with TB challenged with catastrophic healthcare expenses before diagnosis and during treatment in Cambodia

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Background: Tuberculosis (TB) is one of the oldest infectious diseases and requires long-term treatment. Although the treatment is provided free of charge in Cambodia, patients must undergo treatment more than 6 months. Only public health facilities are authorized to diagnose and determine treatment outcomes. Despite community-based care availability, TB patients often travel and spend time accessing services , incurring out-of-pocket expenses before diagnosis and during treatment. The study aimed to identify the magnitudes of catastrophic costs borne by TB-affected households.
Design/Methods: A total of 788 patients were randomly selected from 40 health centers and referral hospitals across Cambodia. Face-to-face interviews were conducted in August 2023. Descriptive analysis examined cost variations of TB drug sensitivity (DS-TB) and drug resistance (DR-TB), sociodemographic characteristics, and care-seeking behaviors. Catastrophic cost was calculated using the output approach: (HH_income_before TB

– HH_income_during_treatment + Total_direct_costs) / HH_income_before TB comparing with 20% threshold.
Results: Of 788 TB patients, 91.4% and 8.6% were DS-TB and DR-TB patients respectively.
Approximately 57.6% of them were males and 40.4% were females. The mean age of DS-TB patients was significantly lower (40.2 ± 23.0 years) than DR-TB patients (47.6 ± 18.6 years), p<0.01. The mean HH income before TB diagnosis was US$ 504.4±453.6 and HH income during treatment was US$ 420.8 ± 434.5. The mean direct costs for all TB forms were US$ 538.9 ± 1,252.6 and indirect costs (time loss) were US$ 489.2 ± 1,475.1. Overall, 34.1% of patients experienced catastrophic costs [CI: 30.8%-37.5%], within DS-TB patients 33.5% [CI: 28.8%-38.5%] and DR-TB patients 39.3% [CI: 19.1%-63.9%].
Conclusions: About one-third of TB patients faced catastrophic healthcare costs and other underlying costs. The Ministry of Health (MoH) and National TB Program (NTP) should strengthen implementation of the free treatment policy and expand the preventive efforts to improve public awareness and early case detection through community engagement and media outreach.

OA21-299-20 Beyond the cost of free treatment, people with presumptive TB in Cambodia face financial hardship before TB diagnosis

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Background: Tuberculosis (TB) treatment is free of charge in Cambodia. Private clinics or hospitals are permitted to diagnosis or treat TB. However, most patients preferred to seek care from private providers while they had TB suspected TB symptoms. The costs associated with these care-seeking behaviors lead to significant financial hardship on TB-affected households. The study aimed to identify the catastrophic costs borne by TB-affected household prior to TB diagnosis.
Design/Methods: A total of 788 TB patients were randomly selected from 40 clusters, a multistage cluster sampling, which are health centers and referral hospitals. Face-to-face interviews were held in August 2023 across Cambodia. Descriptive analysis was performed to determine the cost variation between drug sensitivity (DS-TB) and drug resistance (DR-TB), sociodemographic characteristics, and care-seeking behaviors. Catastrophic cost was calculated as total out-of-pocket expenditure on medical and non-medical costs divided by total annual household expenditure using 25% threshold.
Results: Among 788 patients, 720 (91.4%) and 68 (8.6%) were DS-TB and DR-TB patients respectively. 470 (57.6%) of them were males and 318 (40.4%) were females. The mean age of DS-TB patients was significantly lower (40.2 ± 23.0 years) than DR-TB patients (47.6 ± 18.6 years), p<0.01. The mean monthly household expenditure did not differ significantly, US$ 503.3 ± 462.4 for DS-TB patients and US$ 516.0 ± 348.3 for DR-TB patients. The mean direct medical cost among DS-TB patients was US$ 102.9 ± 363.1, while and US$ 13.7 ± 41.2 among DR-TB patients. Approximately 79.2% (570) of DS-TB patients and 77.9% (53) of DR-TB patients experienced catastrophic cost.
Conclusions: The findings suggest that a significantly high proportion of TB-affected households incur catastrophic healthcare costs before a TB diagnosis was made. The National TB Program should consider strengthening and expanding the preventive activities to improve public knowledge and healthcare-seeking behavior utilizing media channels and local authorities to raise awareness and case detection efforts.

OA21-300-20 Financial burden of people with TB in Nepal: Assessing catastrophic costs and mitigation strategies

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Background: Tuberculosis remains the seventh leading cause of death in Nepal, presenting a significant public health and socioeconomic challenge. The third goal of the End TB Strategy is to ensure that no household affected by TB incurs catastrophic costs due to the disease. To assess the economic impact of TB and the proportion of households facing financial hardship, Nepal's National TB Program conducted a nationwide TB patient cost survey.
The study assessed the costs associated with TB diagnosis and treatment, determined the proportion of households facing catastrophic costs, and provided evidence-based recommendations to mitigate economic barriers.
Design/Methods: A nationally representative, cross-sectional TB patient cost survey was conducted using a stratified cluster sampling approach. The study included

face-to-face interviews with 600 patients diagnosed with drug-susceptible TB and 400 patients with drug-resistant TB across all seven provinces. All data analysis was performed using Stata/BE 17.0 (Stata Corp LLC).

Results: The survey found that over half (51%) of TB affected households faced catastrophic costs, with DR TB households disproportionately impacted (75%) compared to DS TB households (50%). The primary contributors to these financial hardships were direct non-medical costs, such as transportation and nutritional supplements, which accounted for 44% of total expenses. Indirect costs, including income loss, contributed 39%, while direct medical costs (e.g., hospitalization, consultation, radiography and other imaging, laboratory procedures, medicine) made up 17%.

Notably, nutritional supplements and additional food intake alone comprised 35% of direct non-medical expenses.

Conclusions: To mitigate these economic burdens, we recommend integrating TB care with social protection programs, and implementing measures to reduce catastrophic costs. Additionally, we suggest empowering patients through vocational training, strengthening mental health support, and fostering a multi-sectoral approach by leveraging existing social initiatives.

OA21-301-20 Assessment of social protection for people affected by TB: Development of an indicator matrix for Brazil

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Background: Social protection constitutes a critical intersection between health and broader social policies. In Brazil, however, there remains a notable scarcity of conceptual frameworks and validated indicators capable of capturing the operationalization and implementation of intersectoral strategies to address tuberculosis.

This methodological study, conducted within the Brazilian context, aimed to develop and validate an evaluation matrix to assess the scope and effectiveness of social protection measures directed toward people affected by tuberculosis.

Design/Methods: The study was carried out between March 2023 and May 2024 in two structured phases. The first phase comprised a scoping review and documentary analysis, culminating in the construction of a Logical Model that guided the development of the Evaluation Matrix. The second phase involved content validation through the Delphi technique, engaging subject-matter experts across two iterative rounds to ensure robust consensus, with a target Content Validity Index (CVI) above 0.80.

Results: The systematic construction of the Evaluation Matrix enabled a comprehensive mapping of the existing social protection landscape for people with tuberculosis at the national level. The final matrix was validated with satisfactory CVIs, reflecting substantial expert agreement. It encompasses four dimensions, 11 subdimensions, 20 evaluative categories, and 53 specific indicators (see Table 1), each with clearly defined parameters and data sources. This matrix provides a rigorous framework for evaluating the implementation of social protection policies in the context of tuberculosis.

Table 1 – Quantitative description of evaluative categories and indicators for each subdimension and their respective dimensions in the evaluation matrix.

Dimensions	Subdimensions	Evaluative Categories	Evaluative Indicators
Right to health	Tuberculosis prevention and care actions in the Brazilian Unified Health System (*SUS*)	03	05
	Food and nutritional security	02	03
	Transportation	01	03
	Work	02	05
	Social control	01	02
	Fight against tuberculosis stigma and discrimination	01	04
Right to social assistance	Access to services, programs, projects, and social assistance benefits in the Brazilian Unified Social Assistance System (*SUAS*)	03	17
Right to social security	Access to social security benefits	04	06
Shared responsibility	Coordination between the Brazilian Unified Health System (*SUS*) and the Unified Social Assistance System (*SUAS*)	01	04
	Intersectoral actions	01	03
	Agility of justice	01	01

Source: the authors (2025).

Conclusions: This study introduces a novel, evidence-based evaluation tool designed to support policy-makers, program managers, and other stakeholders in advancing equitable and context-responsive social protection interventions for people affected by tuberculosis. Its application holds potential to strengthen intersectoral collaboration and inform strategic policy development at multiple levels.

OA21-302-20 Evaluating social capital of 2382 people with pulmonary TB: A cross-sectional survey nested within the community-randomised controlled CRESIPT trial, Peru

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Background: Tuberculosis (TB) is a social disease linked with poverty, marginalisation, social isolation and loneliness. These factors lead to low social capital which predicts poor health.
To end TB, National TB Programmes need to tackle social inequalities which perpetuate and exacerbate TB illness, including poor social capital.
Design/Methods: CRESIPT was a non-blinded, community-randomized, controlled trial undertaken between 2012 and 2022 in 32 urban and peri-urban impoverished communities in Lima, Peru. Communities were randomised to either standard of care (SoC) from Peru's NTP or the same SoC plus a socioeconomic intervention consisting of conditional cash transfers and peer-led support. All PTB >= 15-years old completed the World Bank's "Shortened and Adapted Social Capital and Perceived Safety Assessment Tool" questionnaire to quantify their social capital.
Quantitative analyses summarised the perceptions of PTB on their community at recruitment in 2016-19.
Results: 2382 PTB completed the SASCAT with median age 31 (range 15-96) and 1527/2382 (64.1%) of whom were male. Less than one quarter (24.52%) PTB had trust in their community (584/2382), 38.62% felt their community would take advantage of them if able (920/2382), and 65.99% reported other community members were only interested in their own wellbeing (1572/2382).
80.89% PTB reported feeling safe or very safe within their home (1927/2382), 61.67% in their neighbourhood (1473/2525), 56.63% (1349/2382) and 41.15% (980/2382) when walking in their neighbourhood any time or at night, respectively. 26.62% PTB felt crime and violence happened often or all the time (634/2382).
64.44% PTB felt community belonging (1535/2382) and only 50.84% reported meaningful community-based friendships (1211/2382). Only 3.82% had engaged in collective action in the previous 12 months (91/2382).
Conclusions: In urban and peri-urban impoverished communities of Lima, Peru, PTB felt high community mistrust and insecurity. Policies addressing neighbourhood security and trust could improve community-based social capital to improve health outcomes.

Table 1| Characteristics of people with TB (PTB) at CRESIPT recruitment, 2016-2019

Variable	Characteristics	Frequency (n= 2382)	Percentage (%)
Demographic			
Median Age, Years (IQR, Range)	31 (24, 15-96)		
Sex	Male	1527	64.1
	Female	855	35.9
Socioeconomic Variable			
Per Capita Household Income Band*	Extreme Poverty	739	31.02
	Poverty	697	29.26
	Poor	586	24.60
*Mean Per Capita Household Income: 406.66 PEN or USD $122.69	Vulnerable	275	11.54
	Middle Class	60	2.52
	Unknown	25	1.05
Clinical Variables			
TB Site	Pulmonary	1988	83.46
	Extrapulmonary	345	14.48
	Both	33	1.39
TB treatment scheme	First line treatment	2110	88.58
	Mono-resistant to R or I	42	1.76
	MDR-TB	164	6.88
	XDR-TB	5	0.21
PTB perceptions on their community (those who answered yes to the following questions)		**Frequency (n= 2382)**	**Percentage (%)**
"Do most people where you live get along with each other?"		Yes: 1029	43.20
"In general, can you trust most people where you live?"		Yes: 584	24.52
"Do you feel that most people where you live are only interested in their own wellbeing?"		Yes: 1572	65.99
"Do you feel that most people where you live would try to take advantage of you (in any way) if they had the chance?"		Yes: 920	38.62
"Do you feel like you belong where you live?"		Yes: 1535	64.44
"Does the friendship you have with the people where you live mean a lot to you?"		Yes: 1211	50.84
"In the past 12 months, have you joined together with other residents where you live to solve a problem or do a job together?"		Yes: 91	3.82
PTB perceptions on physical safety N.B. responses = very safe, safe, a little safe, unsafe			
"In general, how safe do you feel where you live?"		Very safe: 197 Safe: 1272	8.27 53.40
"How safe you do feel in your home?"		Very safe: 426 Safe: 1501	17.88 63.01
"How safe do you feel when walking around where you live?"		Very safe: 146 Safe: 1203	6.13 50.50
"How safe do you feel walking alone in your area at night?"		Very safe: 109 Safe: 871	4.58 36.57
PTB perceptions on crime and violence N.B. responses = all the time, often, from time to time, never			
"Do you think there is crime and violence where you live?"		All the time: 285 Often: 349	11.96 14.65

OA21-303-20 People power against TB: Janbhagidari as a transformative force in India's 100-Day TB Elimination campaign

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Background and challenges to implementation: India's ambition to eliminate tuberculosis (TB) by 2025 requires more than clinical interventions—it calls for deep community engagement. The 100 Days TB Mukt Bharat Abhiyan, launched in December 2024, gave form to this approach through *Janbhagidari*—a nationwide movement mobilizing people's participation to drive awareness, improve early detection, and reduce stigma in high-burden districts.
Intervention or response: To foster collective ownership of TB elimination, Janbhagidari was integrated across all campaign levels. Citizens, elected representatives, community influencers, and institutions were engaged through structured outreach, public pledges, and targeted IEC efforts. Ministries, schools, corporates, religious organizations, and Panchayati Raj Institutions (PRIs) worked in tandem to create a unified, community-led response.

Results/Impact: From December 7, 2024, to March 17, 2025, over 3.69 crore individuals were screened and 2.16 lakh new TB cases diagnosed, including a 120% increase in asymptomatic case detection compared to the same period in 2023. The campaign saw 41,710 Janbhagidari-related activities across 22 line ministries, and 24,157 additional events by PSUs, trade associations, and voluntary organizations. In schools, 55,774 TB awareness sessions engaged students and educators. High-risk settings were prioritized, reaching 46,344 individuals in prisons, 92,553 in mines, 50,592 in tea gardens, 1,37,369 at construction sites, and 90,898 in other workplaces. Cultural and faith-based outreach extended further through 23,741 activities during festivals and gatherings. Strong political participation was evident, with 162 Members of Parliament, 1,290 MLAs, and 32,286 PRI and ULB representatives contributing actively. This wide-scale engagement enhanced public awareness, encouraged timely care-seeking, and expanded access to essential TB services.
Conclusions: The Janbhagidari-driven campaign redefined TB control in India as a shared societal mission. It demonstrated how community ownership, political will, and intersectoral coordination can collectively advance national disease elimination goals and serve as a model for global health strategies.

OA21-304-20 Breaking the cycle: Integrating economic empowerment into TB care for sustainable outcomes in Indonesia

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Background and challenges to implementation: Tuberculosis (TB) is both a cause and consequence of poverty. Socio-economic vulnerability—including poor living conditions, malnutrition, stigma, and limited access to care—drives TB transmission and undermines treatment adherence. While biomedical strategies like DOTS have improved case detection and cure rates, evidence shows that addressing socio-economic determinants is critical to achieving long-term impact.
Intervention or response: To complement existing TB interventions, Stop TB Partnership Indonesia piloted an economic empowerment program targeting three TB-affected families identified through financial assessments and catastrophic cost analysis. The intervention began with structured entrepreneurship training over the course of a week, covering business fundamentals, opportunity mapping, production planning, and technical skills in wooden toy manufacturing—selected based on local material availability and artisan potential. What differentiates this initiative from other livelihood programs is that TB-affected individuals were equipped not only with vocational skills but also with essential business management and marketing capabilities. This comprehensive preparation proved to be a key factor in the program's success.
Results/Impact: Each family received start-up capital in the form of tools and raw materials, followed by monthly mentorship and business monitoring. Within several months, families began producing and selling custom wooden toys, generating an average profit of USD 70 per month. Although not a primary income source, this earning supplements treatment-related costs and provides a form of sustainable social protection. Importantly, increased motivation and improved treatment adherence were also observed among participants.
Conclusions: This initiative demonstrates the feasibility and value of integrating socio-economic support into TB care. Economic empowerment can reduce financial hardship, support treatment success, and build long-term resilience. Such approaches should be scaled and embedded within national TB programs to break the poverty-TB cycle and ensure no one is left behind in the effort to end TB.

OA21-305-20 Cost-effectiveness of conditional cash transfers with pre-test and post-test TB counselling in South Africa: A mathematical modelling study

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Background: Tuberculosis (TB) remains a significant global health challenge, disproportionately affecting low-income populations due to socioeconomic barriers, including poverty, malnutrition, and healthcare access constraints. Conditional cash transfer (CCT) interventions have emerged as promising strategies to improve TB treatment adherence, mitigate economic hardship, and enhance health outcomes. However, there is a paucity of

studies exploring the cost-effectiveness of such strategies, particularly when combined with pre-test and post-test tuberculosis counselling.

Design/Methods: This analysis used results from a pragmatic, multicentre, open-label, individual randomised controlled trial conducted between October 2018 and March 2020 in South Africa. Trial results on treatment initiation, treatment completion and on-treatment mortality informed a compartmental model of TB transmission in South Africa where a CCT intervention with pre-test and post-test tuberculosis counselling is offered to all notified adults affected by drug sensitive TB between 2025 and 2050. Epidemiological modelling results were combined with cost data to determine the cost-effectiveness of the intervention from the provider perspective. We estimated the incremental cost-effectiveness ratio (ICER) per disability-adjusted life year (DALYS) averted by comparing our intervention with the standard of care.

Results: Universally applying the CCT intervention would lead to a decrease of 11% TB incidence and 17% TB mortality by 2050 in South Africa, compared to standard of care. The incremental cost of the intervention was estimated at $80.4 USD per patient, leading to a total increase of 7% in TB budget (i.e. ~20 million USD per year) between 2025 and 2050. The intervention was cost effective at ICER of $148.7 per DALY averted compared to a cost-effectiveness threshold (CET) of $3,015-3,314 USD.

Conclusions: CCT interventions with pre-test and post-test counselling appear to be cost-effective in South Africa, leading to a long-term reduction in TB incidence and mortality, and a potential reduction in the risk of catastrophic costs to households.

OA21-306-20 Policy gaps in social protection for people affected by TB: Evidence from high-burden municipalities in Rio de Janeiro, Brazil

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Background: Tuberculosis (TB) remains a major public health concern in Brazil, particularly in socioeconomically vulnerable populations. Although social protection is a key pillar of the End TB Strategy, mechanisms to ensure financial support and food security for people affected by TB remain fragmented. In Brazil, despite national social assistance programs, local-level implementation is inconsistent. This study examines the presence and scope of normative frameworks related to social protection in high-burden TB municipalities in Rio de Janeiro.

Design/Methods: A documentary review was conducted in ten municipalities in Rio de Janeiro state with the highest TB burden. Official websites and public records were systematically screened for laws, decrees, and regulations published since 2020 that address social protection. Documents were categorized by level (municipal or federal), type of benefit (e.g., food support, transport, cash transfer), and explicit inclusion of TB-affected individuals. Data were analyzed descriptively to identify patterns, limitations, and gaps.

Results: A total of 79 normative acts were identified across the selected municipalities. Most documents addressed broad social programs such as food security or poverty reduction. However, none explicitly mentioned individuals undergoing TB treatment as a target group. Only two municipalities offered structured food support linked to health services, but eligibility and implementation criteria were often unclear. The absence of tailored provisions and intersectoral coordination indicates a disconnect between TB care and social protection strategies, particularly in high-burden urban areas.

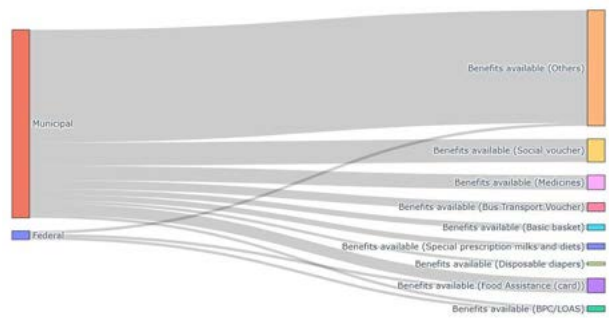

Figure 1 – Flow between normative level and types of social benefits.

Conclusions: Findings reveal critical gaps in the normative landscape of social protection for people affected by TB in Rio de Janeiro. The lack of explicit policies and integration between health and social sectors may hinder treatment adherence and equity. Strengthening local governance and institutionalizing targeted social support are urgent to align municipal policies with global TB control strategies and protect vulnerable populations from avoidable hardship.

OA22 Understanding the impact of case finding modalities: From the facility to the population

OA22-307-20 Stamping out missed TB cases: Evaluating a novel screening strategy on TB presumption and detection from Kunda Nqob'iTB project in Zimbabwe

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Background and challenges to implementation: Tuberculosis (TB) case finding through systematic screening at healthcare encounters is a strategy to enhance detection within resource-constrained settings. We investigated the potential impact of the Stamp Strategy, using WHO 4-Symptom Screen (4SS) stamped on client booklets, on TB presumptive case identification and yield in Zimbabwe. The Kunda Nqob'iTB (KN-TB) project implemented this strategy to facilitate routine TB screening.
Intervention or response: Healthcare workers across 102 facilities in Insiza, Gwanda, Chirumhanzu and Zvishavane districts received training on the Stamp Strategy in August 2023 and February 2024. Upon arrival, the 4SS was stamped onto client cards, prompting workers to screen clients. Clients screening positive were requested to provide sputum for Xpert MTB/Rif testing. Annual data on presumptive TB cases and yield in 2024 were compared to pre-implementation baseline data from 2023 to evaluate the strategy's impact.
Results/Impact: Overall, the number of presumptive TB cases increased from 11,849 in 2023 to 14,459 in 2024, representing a 22% rise ($p<0.05$, 95% CI). Three of the four districts demonstrated an increase in presumptive TB cases, with Zvishavane exhibiting a surge in monthly cases, peaking at 942 in March 2024 compared to 340 in August 2023. Although modest increase in total TB cases was observed from 1,047 in 2023 to 1,074 in 2024 (2.58% growth, $p=0.78$) the overall yield of TB found reduced (8.8% to 7.4%). Notably, TB cases in the 0–4 years age group showed an increase (82%), rising from 17 to 31 cases.
Conclusions: The Stamp Strategy represents a simple intervention for enhancing TB case finding within facilities in Zimbabwe. Its implementation was associated with an increase in presumptive TB cases and overall TB cases. Reduced yield could be due to added clients presumed having mimickers of TB as well as difficulty in controlling for confounders. Additional assessment of treatment outcomes would be ideal.

OA22-308-20 Modelling the epidemiological impact of strengthening intensified TB case-finding in health facilities in India

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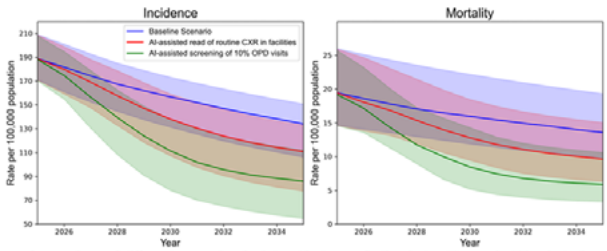
Background: In high TB burden settings such as India, it is important to find and treat TB as rapidly as possible, to limit opportunities for transmission. This challenge is further aggravated by the prevalence of asymptomatic TB.
While mass screening in communities can be resource-intensive, growing evidence suggests that intensified case-finding in healthcare facilities may have substantially higher yield. This study aims to quantify the potential impact of facility-based TB screening, on TB incidence and mortality in India.
Design/Methods: We developed a deterministic compartmental TB transmission model for India stratified by health facility and community settings, incorporating the natural history of TB, routine TB services, and presentation to health facilities for other conditions. We calibrated the model to epidemiological data from India and healthcare utilisation.
We modelled the potential impact on incidence and mortality in India, under two screening scenarios:
(i) AI-assisted analysis of all chest X-rays (CXR) routinely being performed irrespective of indication
(ii) pro-active screening with AI-assisted CXR and symptoms, prioritised for patients with known TB risk factors, and overall covering 10% of patients presenting to facilities.
In both scenarios, we assumed that presumptive TB cases would have sputum microbiologically tested with NAAT.
Results: By 2030 AI-assisted reads of routine CXR would avert 6.5% (95% UI 2.7 -14) of cumulative TB incidence and 11% (95% UI 4.4 - 21) of cumulative TB deaths. Proactive screening would avert 18% (95% UI 8.8 - 29) of cumulative TB incidence and 31% (95% UI 14 - 46) of cumulative TB deaths over this period.



Comparison of different scenarios for intensified case-finding in healthcare facilities in India. Shown are scenarios of: (i) AI-assisted reads of routinely conducted CXRs (in red) and (ii) proactive screening, using AI-assisted CXR and symptoms in parallel, prioritised for patients with known TB risk factors, and overall covering 10% of patients presenting to facilities (in green). Being a more proactive strategy, the latter scenario will require greater investment and programmatic effort. While these scenarios emphasise impact, informed programmatic decision-making will require further analysis of cost-effectiveness. The solid lines denote the central estimates and the shaded region denote the uncertainty intervals of each scenario respectively.

Conclusions: These findings highlight the untapped potential of health facilities as key entry points for systematic TB screening in India. Further analysis of cost-effectiveness will facilitate programmatic decision-making. Overall, by reaching individuals who are already seeking care, we can detect cases earlier, and substantially reduce transmission.

OA22-309-20 Modelling 'targeted universal testing for TB' vs symptom-based screening in South Africa

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Background: South African guidelines recommend targeted universal testing for TB (TUTT) in primary healthcare clinics, i.e. testing clinic attendees in specified groups (people with HIV [PWH], recent TB, or close contact with a person with TB) with Xpert Ultra, regardless of reported symptoms.
We contrast this with universal symptom-based screening (SBS), assuming all clinic attendees are screened, and tested if symptomatic.
Design/Methods: We developed an individual-based mathematical model of TB in South Africa, incorporating variation in clinic visiting rates by sex, ART status, and TB symptoms, and between individuals; and the high levels of uncertainty in TB natural history with respect to symptoms.
We assume in the baseline scenario that people on ART have a probability of Xpert testing each visit, through annual testing or active symptom-screening, and that people not on ART (PWH or HIV-negative) are only tested if seeking care for TB symptoms. We modelled nationwide TUTT and SBS from 2025–2034, and compared them to the baseline scenario.
Results: SBS and TUTT reduced cumulative TB incidence in 2025–2034 by 38% (95% CI 31–45%) and 23% (20–28%) respectively (Table).
Compared to TUTT, SBS required 23% (3.3%–36%) more Xperts, but increased the proportion of the entire population receiving at least one test in 2025 by 52% (33%–66%), and improved yields per Xpert by 31% (9.2%–66%). SBS resulted in a 51% (95% CI 43–58%) reduction in the proportion of TB episodes that ended in death, compared to 28% (23–33%) for TUTT.

		Baseline (median (95% CI))	Symptom-based screening (median (95% CI))	TUTT (median (95% CI))
Reduction in TB incidence 2025-34 [in 2034]			0.38 (0.31 – 0.45) [0.60 (0.51 – 0.68)]	0.23 (0.20 – 0.28) [0.38 (0.32 – 0.44)]
Reduction in TB mortality 2025-34 [in 2034]			0.51 (0.43 – 0.57) [0.71 (0.62 –0.78)]	0.31 (0.27 – 0.37) [0.47 (0.40 –0.53)]
Xpert tests used in clinic-based active screening/100,000 population in 2025		16012 (14185 – 17914)	63711 (52868 – 72220)	52101 (47278 – 57289)
Proportion of the population receiving an Xpert test as part of clinic-based active screening in 2025		0.030 (0.027 – 0.033)	0.096 (0.083 – 0.11)	0.063 (0.058 – 0.068)
Yield of people with TB per 100 Xpert tests as part of clinic-based active screening in 2025		3.7 (3.0 – 4.5)	4.3 (3.4 – 5.7)	3.2 (2.7 – 3.8)
Number of people with true positive TB starting treatment in 2025/100,000 population	Not on ART (PLH or HIV-)	195 (170 – 225)	431 (361 – 524)	294 (258 – 339)
	On ART	134 (114 – 161)	158 (134 – 188)	179 (151 – 217)
	Overall	330 (295 – 372)	591 (506 – 701)	474 (418 – 540)
Proportion of TB episodes starting in 2025 that end in TB mortality		0.20 (0.16 – 0.24)	0.10 (0.072 – 0.12)	0.15 (0.11 – 0.18)

Conclusions: SBS needed a modest increase in Xpert tests, but improved yields, resulted in greater reductions in TB incidence, and improved TB outcomes by a greater amount than TUTT. The impact of TUTT may be undermined by its focus on PWH, a group in which the coverage of clinic-based testing is already relatively high.

OA22-310-20 Does active case-finding detect people with TB early in programme settings? A national level study from India

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Background: India's national tuberculosis program implements active case-finding (ACF) in high-risk populations. In 2023, we determined the differences in extent of severe illness and pre-treatment delay at diagnosis among public-notified ACF- and passive case-finding (PCF)-detected adults (≥15 y) with drug-sensitive pulmonary tuberculosis.
Design/Methods: This was a cross-sectional analytical study involving primary and secondary data from 28 randomly sampled districts (nine states). All ACF-detected and randomly sampled PCF-detected were enrolled. Severe illness was defined as presence of very severe undernutrition or respiratory insufficiency or poor performance status.
Results: Of 790 enrolled, 426 were ACF- and 364 were PCF-detected. When compared to PCF, ACF-detected adults were significantly older, living farther away from a diagnosis facility, less exposed to formal education, poorer and experiencing lower number of healthcare provider visits.

	ACF-detected		PCF-detected		
Type of delay	Total assessed n^	Delay Median (IQR)	Total assessed n^	Delay Median (IQR)	P value*
Patient level (a)	310	30 (10,70)	292	30 (8,67)	0.333
Health system level – diagnosis (b)	335	2 (0, 9)	309	1 (0, 21)	0.165
Health system level – treatment initiation (c)	422	2 (1,5)	360	1 (0,3)	<0.001
Diagnosis delay (a+b)	340	42 (20,92)	292	43 (21,92)	0.811
Health system level (b+c)	333	6 (3,14)	308	4 (2,21)	0.104
Total pre-treatment delay (a+b+c)	338	46 (24,95)	291	46 (22,94)	0.595

TB: tuberculosis; ACF: active case-finding; PCF: passive case-finding; IQR: inter-quartile range; @of 790 enrolled, 672 (85.1%) were interviewed for pre-treatment delays; ^both dates available to calculate the corresponding delay among 672 interviewed; *Mann Whitney U test

Table. Pre-treatment delay among adults (≥15 y) with drug-sensitive pulmonary TB from high-risk populations, notified by public sector, enrolled@ and interviewed@ across 28 randomly selected districts in India, 2023, stratified by ACF- and PCF-detected [N=672]@

Pre-treatment delay from symptom onset to treatment initiation (median 46 days among both, see Table) and extent of severe illness (39% and 34%, p=0.180) were not significantly different in both groups.
Conclusions: This is the first nationally representative assessment of ACF in terms of early detection. Though ACF identified more marginalized people and reduced healthcare provider visits, this did not translate into early diagnosis. High burden of severe illness at diagnosis is a concern.

OA22-311-20 Using geolocation data to inform TB active case finding in the Kulob Zero TB project, Tajikistan

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Background: Tajikistan faces a high tuberculosis (TB) burden compounded by low TB awareness among the population and healthcare workers. Médecins Sans Frontières (MSF) initiated the Zero TB project in Kulob to demonstrate the feasibility of active case finding (ACF) using computer-aided chest radiography (CAD4TB) and symptom screening.
Design/Methods: We retrospectively analysed programmatic and geographical data collected between January 2022 and December 2024 from Kulob City and four surrounding Jamoats (sub-districts). People with TB were diagnosed through passive case finding (PCF) after presenting at health centres, or our ACF intervention (between May 2023 and December 2024). Geolocation data for people who started TB treatment were mapped to a lower-level geographical unit (healthcare catchment area) and integrated with population data to calculate annual TB case notification rates (CNR). Spatial maps were developed, and a mixed-effect Poisson model accounting for administrative hierarchy was used to identify factors associated with TB CNRs.
Results: 14,823 people were screened in our ACF intervention (64% female, median age=36 years), of whom 811 (5.5%) were referred for diagnostic evaluation. 22/811 (2.6%) were diagnosed with TB and 21/22 (95%) started TB treatment. Including those diagnosed through PCF, 485 people started TB treatment during the study – an overall CNR of 77/100,000 (95% confidence interval [95%CI]: 71-85). Among 121 geographical units (mean

population size=1,725 people), the TB CNR ranged from 0-575/100,000, with 37/121 (31%) units considered as TB transmission hotspots with CNRs ³100/100,000. Higher TB CNRs were associated with being in an urban versus rural area (adjusted rate ratio [aRR]=1.64, 95%CI: 1.14-2.36), and household size (aRR per additional person per house=1.05, 95%CI:1.00-1.11).

Conclusions: Spatial analysis facilitated the identification of TB transmission hotspots in Kulob Districts. This information will be used to optimise targeted, evidence-based TB screening, prevention, and education interventions as part of the Zero TB project.

OA22-312-20 Modelling the impact of case finding for TB: The role of infection dynamics

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Background: Population-level case-finding is recommended as a strategy to reduce the global burden of tuberculosis. Mathematical models consistently project that case-finding will yield only modest reductions in incidence, but have tended not to account for the possibility that some *M. tuberculosis* (*Mtb*) infections may be cleared.

We evaluated whether the common assumption of lifelong risk of progression after infection leads models to undervalue the impact of case-finding.

Design/Methods: We constructed two mathematical models of *Mtb* transmission: one assumed lifelong progression risk after infection ("Conventional"), and the other assumed that some individuals eventually clear their infections ("Clearance"). We calibrated these otherwise similar models to the same set of empirical data on tuberculosis burden (in India) and progression after infection (from longitudinal cohorts).

We then projected the impact of biennial community-wide active case-finding campaigns, covering 70% of the population with a screening algorithm having 65% sensitivity, with or without accompanying provision of tuberculosis preventive treatment (TPT).

Results: Relative to the Conventional model, the Clearance model was able to better fit data on disease incidence, *Mtb* infection prevalence, progression to disease over time since infection, and incidence trends.

The Clearance model also projected a greater impact of case-finding on tuberculosis incidence – both in terms of overall magnitude (26% [95% uncertainty interval 15-41%] vs. 11% [7-24%] reduction in incidence after 10 years; *Figure*) and relative to TPT (with case-finding representing 33% [19-50%] vs. 14% [8-30%] of combined case-finding/TPT impact).

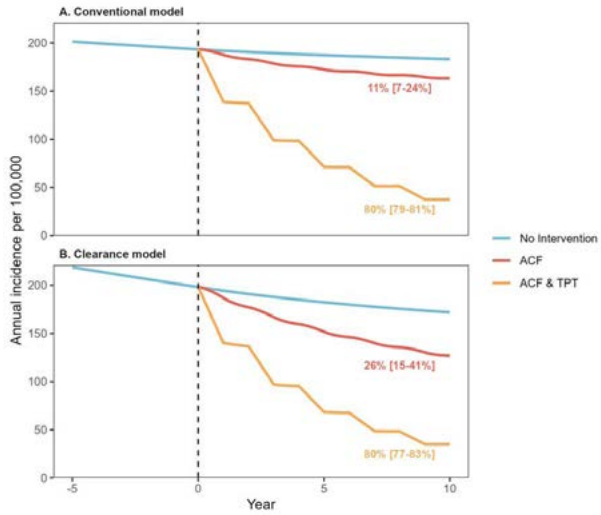

Figure: Effect of considering immune clearance on the impact of mass case-finding & prevention
Figure shows the projected mean annual TB incidence per 100,000 people over ten years of simulated interventions (years 0 through 10), including: no intervention (blue), Active Case-Finding (ACF) waves every 2 years (red-orange), and the same ACF waves with tuberculosis preventive treatment (TPT) added (yellow). Text labels indicate the percent reduction in incidence at year 10 (means and 95% uncertainty intervals), relative to no intervention. Panels differ by whether the model structure allows clearance of some Mtb infections (panel A = conventional model without clearance; panel B = allowing clearance of some infections). Incidence trends in the 5 years preceding the intervention period are also shown in each panel (years -5 through 0).

Conclusions: Given that clearance of a fraction of *Mtb* infections is biologically likely, and that our model incorporating clearance yielded a better fit to empirical data, we conclude that the epidemiological impact of population-level case-finding for tuberculosis may be greater than projected by most previous models, which do not account for clearance.

OA22-313-20 Simulating the ACT3 trial: How TB natural history determines the durability of community screening

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Background: The ACT3 trial in Vietnam showed a 44% reduction in TB prevalence after three rounds of universal Xpert-based screening. However, concurrent declines in the control arm complicate attribution, and generalizability to higher-burden settings remains uncertain. As TB community screening expands, modeling tools are needed to project long-term impact and separate intervention effects from background trends.

Design/Methods: We developed TBsim, a flexible, open-source agent-based modeling framework for simulating TB natural histories, screening strategies, and long-term outcomes. Using TBsim, we implemented two competing natural history models: (1) a traditional latent reactivation model and (2) a reinfection-dominant undulation model.

Both were calibrated to ACT3 trial data and Vietnam national TB trends. We then simulated post-trial trajectories across lower- and higher-burden settings, with and without secular declines, and quantified prevalence reductions attributable to intervention versus background change.

Results: Both models reproduced trial-period declines (Intervention: −32%/yr; Control: −17%/yr). However, their long-term projections diverged. In lower-burden settings with flat secular trends, the reinfection model projected a sustained ~25% prevalence reduction a decade after screening, while the latent model rebounded to within ~10% of baseline. The intervention explained ~80% of the decline under the reinfection model, versus ~50% under the latent model. This suggests community screening can have durable impact if recent transmission drives incidence. However, tools like genomic epidemiology remain limited for distinguishing recent from remote infection in high-burden settings.

Conclusions: Our calibrated trial simulation enables causal decomposition of TB trends and highlights the risks of mischaracterizing natural history. When latent infections dominate, short-term screening alone may yield little lasting benefit. Until more direct measurements are available, simulation-based inference provides a practical way to estimate impact and assess whether individual control strategies are sufficient.

OA22-314-20 Potential impact of community-wide screening approaches for TB: A modelling study across the spectrum of disease

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Background: Approaches to tuberculosis (TB) prevention and care focus mainly on symptomatic disease but have failed to reduce disease burden at the pace required to meet global targets. Community-wide screening has enabled rapid declines in TB burden in historic and some contemporary settings. However, the potential epidemiological impact of different algorithms and approaches has not been evaluated in the context of the wider spectrum of disease.

Design/Methods: We explored the impact of approaches to community-wide screening, considering diagnostic algorithms (prolonged cough with confirmatory GeneXpert Ultra [Cough+Xpert]; chest X-ray with confirmatory GeneXpert Ultra [CXR+Xpert]; GeneXpert Ultra [Xpert-only]; chest X-ray [CXR-only]) implemented at different levels of population coverage for different durations. We examined these approaches using a model that recognises symptomatic (sTB) and asymptomatic infectious TB (aTB), as well as non-infectious TB (nTB), calibrated to infectious TB (infTB) prevalences of 1,000, 500, and 250 per 100,000 population. We assessed diagnostic performance, diagnostic efficiency, and impact on disease burden.

Results: Symptom-agnostic algorithms led to greater reductions in sTB incidence (13.3% [95% uncertainty interval: 11.3-15.5%] with CXR+Xpert, and 17.5% [15.0-20.1%] with Xpert-only, for 2 rounds with 50% coverage) than symptom-dependent screening (5.6% [4.7-6.7%] with Cough+Xpert, for same approach). Algorithms that detect non-infectious TB are likely to have even greater impact (47.6% [44.7-50.1%] with CXR-only, for same approach), but tools do not currently exist to diagnose this state without large numbers of false positive results (13.5k [10.7k-16.4k] with CXR-only, for 1 round with 100% coverage). We found limited epidemiological impact for single rounds of screening or multiple rounds of screening with low population coverage. Relative performance of algorithms was similar across prevalences.

Median projected reduction in 2035 sTB incidence (%)

	Population coverage									
Rounds	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Cough+Xpert										
1	0.6	1.2	1.7	2.3	2.9	3.5	4.1	4.7	5.3	5.9
2	1.2	2.3	3.4	4.5	5.6	6.6	7.6	8.6	9.6	10.5
3	1.7	3.4	5.1	6.6	8.2	9.6	11.0	12.4	13.8	15.0
4	2.3	4.6	6.7	8.8	10.8	12.6	14.4	16.1	17.8	19.4
5	2.9	5.7	8.4	10.9	13.3	15.5	17.7	19.9	21.8	23.7
CXR+Xpert										
1	1.4	2.8	4.1	5.5	7.0	8.4	9.8	11.2	12.7	14.0
2	2.8	5.4	8.1	10.7	13.3	15.9	18.2	20.7	23.0	25.2
3	4.1	8.1	11.9	15.7	19.3	22.7	26.2	29.1	32.2	35.2
4	5.5	10.7	15.7	20.5	25.0	29.2	33.2	37.0	40.6	43.9
5	6.9	13.4	19.5	25.1	30.4	35.1	39.9	44.1	48.2	51.6
Xpert only										
1	1.8	3.7	5.6	7.4	9.3	11.3	13.1	15.1	17.0	18.9
2	3.7	7.3	10.8	14.2	17.5	20.7	23.9	26.9	29.7	32.6
3	5.5	10.8	15.8	20.6	25.0	29.5	33.2	37.1	40.7	44.0
4	7.4	14.2	20.6	26.6	32.1	37.1	41.8	46.1	50.1	53.8
5	9.2	17.5	25.3	32.4	38.5	44.4	49.7	54.0	58.3	62.2
CXR only										
1	5.2	10.5	15.9	21.4	26.9	32.7	38.6	44.4	50.6	56.8
2	10.3	20.2	29.7	38.8	47.6	55.6	63.2	70.3	76.8	82.5
3	15.1	29.0	41.7	52.9	62.7	71.4	78.6	84.6	89.4	93.1
4	19.9	37.2	51.8	64.0	73.8	81.7	87.7	92.2	95.3	97.4
5	24.5	44.6	60.4	72.7	81.9	88.5	93.1	96.1	97.9	99.0

Conclusions: Community-wide screening can contribute to rapid reductions in TB burden, with greater impact from approaches that reach larger proportions of the spectrum of disease.

OA22-315-20 Estimating the epidemiological impact of the CAST TB Uganda: A modelling analysis

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Background: Since 2022, the Community Awareness, Screening, Testing, prevention and treatment to end TB Campaign (CAST) has been implemented in Uganda. During each twice-yearly campaign, 10 to 15% of the total population was screened for symptoms of tuberculosis (TB), with confirmatory testing by GeneXpert Ultra. Case notifications increased over 25% from 2021 to 2022 but impacts on incidence and mortality are unknown.
Design/Methods: We used a deterministic TB transmission model, calibrated to TB prevalence, incidence, mortality, and notifications prior to CAST implementation. We replicated community screening in line with the CAST approach. We also simulated a scenario where symptom screening was replaced with digital chest X-ray screening from 2026. We compared each screening approach against a no-intervention scenario where no community screening had occurred and assessed incidence and mortality in 2025 and 2030.
Results: In 2025, after three years of CAST, the national incidence of TB was estimated to be 4.8% [95% uncertainty interval (UI) 3.3 - 6.6%] lower than if CAST had not been introduced, saving 1,700 [UI 1,400 - 2,000] lives. Continuing CAST TB through to 2030 could achieve a 9.9% [UI 6.7 - 13.8%] incidence reduction relative to no-intervention, saving a further 6,000 [UI 4,700 - 7,700] lives. If CAST shifted from symptom screening to digital chest X-ray screening, incidence in 2030 could be 24.2% [UI 20.4 - 28.6%] lower relative to no intervention, saving an additional 1,600 [UI 1,100 - 2,200] lives compared to symptom screening alone.
Conclusions: Twice-yearly mass TB screening has likely not only increased case notifications, but also led to substantial reductions in incidence and mortality in Uganda over the past three years. Even greater impact could be achieved by shifting from symptom screening to digital chest X-ray screening.

OA22-316-20 Can temporary mass screening campaigns accelerate declines in TB incidence in high-burden TB/HIV countries?

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Background: Population-level tuberculosis (TB) screening might help close the global TB detection gap. Whether temporary mass screening campaigns could accelerate declines in TB incidence in high-burden countries is currently not well understood. Using mathematical modelling, we aimed to estimate the population-level impact of a screening campaign among high-risk individuals on TB incidence in South Africa and explored the differential impact among people living with HIV (PLWH) and those not living with HIV (PNLWH).
Design/Methods: We used a calibrated, compartmental transmission-dynamic model of TB in South Africa to simulate a temporary, community-based mass screening intervention involving 10 million people annually from 2025 to 2027.
Following initial risk assessment based on TB symptoms, HIV status and other key TB risk factors, high-risk individuals were offered a non-sputum-based rapid molecular TB test. The primary outcomes modelled were reductions in TB incidence and mortality over a 15-year period (2025-2040).

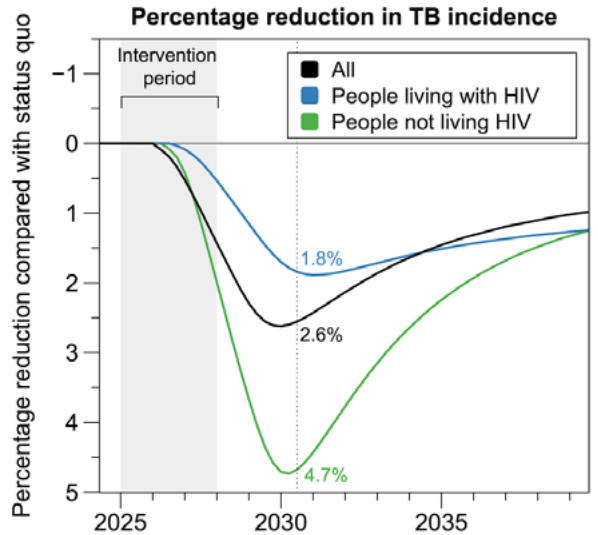

Figure: Projected percentage reductions in tuberculosis (TB) incidence rates under a temporary mass screening campaign among high-risk individuals in South Africa compared to the status quo (no screening) from 2025 to 2040. The figure presents mean estimates from 1,000 simulated model trajectories for the general population (black line), people living with HIV (blue line), and people not living with HIV (green line). Percentage reductions in TB incidence compared to status quo which peaked during 2030 are labelled for each sub-group. The 3-year intervention period is shaded in grey.

Results: In the absence of the intervention, we estimated 3.59million (95% uncertainty interval [UI]: 2.82-4.47million) incident TB cases and 475,000 [358,000–629,000] TB-related deaths between 2025–2040. Of 30million screened during 2025-2028, 9.31million were considered high-risk and tested: 4.36million (90.0% of 4.85million) PLWH, and 4.95million (19.6% of 25.15million) PNLWH. Mass screening reduced incident TB cases by 1.75%(1.06–2.78%) and TB deaths by 4.17%(3.15–5.56%) over 2025-2040. TB incidence reductions peaked ~2.5 years post-intervention, then diminished over time, with greater impact on PNLWH (4.7%) compared to PLWH (1.8%), though effects converged by 2040 (Figure).
Conclusions: A temporary mass screening campaign may reduce TB incidence in the short term in South Africa, particularly among PNLWH, but yields only modest long-term impact. We speculate that persistent delays in care-seeking, a high pool of latent TB infections, and higher reactivation risk especially among PLWH, may limit sustained impact. Combining screening with TB preventive therapy or repeated campaigns might enhance the benefits of screening.

OA23 Prevention, diagnosis, and treatment for people living with HIV

OA23-317-20 Assessing TB vaccine confidence in South African adults with HIV

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Background: Although several TB vaccines are in late-stage clinical trials, there is limited understanding of TB vaccine attitudes among persons likely to be eligible, particularly in the context of rising vaccine hesitancy following the COVID-19 pandemic. We assessed TB vaccine confidence and associated socio-behavioral factors in South Africa to inform strategies for successful TB vaccine implementation.
Design/Methods: We conducted a cross-sectional survey in 2024 at two South African public health clinics serving people with HIV (PWH). Surveys were administered at follow-up visits at least 6 months after undergoing TB screening as part of a study of PWH initiating ART.
Vaccine confidence was defined as willingness to receive a hypothetical, approved TB vaccine and timing of receipt. Kruskall-Wallis analyses examined the relationship between vaccine confidence and socio-behavioral factors.
Results: We surveyed 225 PWH (57% female) with median age 34 years (IQR 27-42), median baseline CD4 count 338 (IQR: 179-514). Of these, 28% had a personal TB history, 96% had ever lived with someone with TB. TB vaccine willingness was 88% "Definitely yes", 12% "Unsure, leaning yes" with nobody "leaning no" or "definitely no." Timewise, 52% would take the vaccine immediately, 48% would wait >=6 months.
Vaccine confidence was significantly higher in participants who perceived TB as an important community health issue, were concerned about contracting TB, or had a history of TB. Vaccine confidence was significantly lower in participants who had lived with someone with TB, used TV/radio for TB information, who relied on friends for general health information, and unexpectedly,

who reported vaccines were compatible with their religion. Age, sex, COVID-19 vaccine status, and safety concerns were not significantly related to vaccine confidence.

	Total Survey N=225	Vaccine Confidence Indicator: 1) Willingness: How willing would you be to take a new TB vaccine if it were approved and 2) Timing: how soon would you receive an approved TB vaccine?					
Clinical/ demographic factors	Response	N (%)	Unsure, Leaning Yes; Wait at least 6 months to over a year	Unsure, Leaning Yes; As soon as available	Definitely Yes; Wait at least 6 months to over a year	Definitely Yes; As soon as available	p-value*
Current or prior diagnosis of TB	Yes (vs. No)	64 (28%)	5 (24%)	1 (17%)	19 (22%)	39 (35%)	p = 0.023
COVID-19 Vaccine Status	Received ≥1 vaccine	52 (23%)	5 (24%)	2 (33%)	16 (19%)	29 (26%)	p = 0.47
Living with a household member who had TB in the past year	No (vs. Yes)	132 (59%)	9 (43%)	3 (50%)	48 (56%)	72 (65%)	p = 0.022
Survey Prompt							
How important do you think tuberculosis is as a health problem for people in your community?	Extremely important (vs. Somewhat / very important)	61 (27%)	4 (19%)	1 (17%)	15 (17%)	41 (37%)	p = 0.0013
Vaccines are compatible with my religious beliefs	Agree (vs. Disagree)	76 (34%)	13 (62%)	5 (83%)	29 (34%)	29 (26%)	p = 0.0006
Personal Concern of Contracting TB	Extremely concerned (vs. Very/ somewhat concerned)	72 (32%)	5 (24%)	1 (17%)	20 (23%)	46 (41%)	p = 0.0026

*Table: Vaccine confidence reported by 225 adults with HIV in South Africa in response to a survey, by clinical and socio-behavioral factors. *p-value from Kruskal-Wallis rank sum test with post-hoc Dunn's test with Bonferroni's correction.*

Conclusions: TB vaccine confidence among South African adult PWH is high. Strategic use of information sources may improve future uptake.

OA23-318-20 Point-of-care biomarker-confirmed adherence to the three-month weekly isoniazid plus rifapentine (3HP) regimen in people with HIV

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Background: TB preventive therapy significantly reduces TB risk in people with HIV (PWH) but requires consistent adherence for effectiveness. Prior evaluations of a point-of-care (POC) urine dipstick with daily isoniazid (INH) demonstrated color changes in the presence of INH metabolites in urine within 48 hours of self-reported ingestion. The utility of a POC urine dipstick test for INH metabolites in the setting of 3HP is unknown.

Design/Methods: We first assessed the window of detectability of INH metabolites using daily urine dipstick testing for 7 days following a directly-observed 3HP dose in 20 participants. Subsequently, we assessed adherence to self-administered 3HP in a prospective cohort of 200 PWH aged ≥15 years through self-reported adherence and monthly urine dipstick tests.

Consistent biomarker-confirmed adherence was defined as positive tests at all monthly assessments for 3 months. We used generalized estimating equations to evaluate correlates of negative biomarker results.

Results: Dipstick tests were positive in 100% (n=20/20) of PWH within 48-hours of DOT 3HP doses. Among 198 PWH on self-administered 3HP with dipstick results, 68% (n=135/198) were female, median age was 35 years (IQR = 27- 44) and 13% (25/198) were in WHO stage 3/4. Of 552 monthly dipstick assessments 32% (n=175/552) were self-reported to be within 48 hours of a self-administered 3HP dose, and 35% (n=192/552) were positive;89% of tests performed within 48 hours of self-reported 3HP injection (n=156/175) tested positive.

Sixteen percent (n=31/198) of PWH had consistent biomarker-confirmed adherence. Negative biomarker tests were associated with the last dose being >48 hours before testing (adjusted risk ratio [aRR]=8.89; 95% CI 4.74 - 16.68).

Conclusions: The urine dipstick test effectively detected INH metabolites within 48 hours of ingestion. Self-reported intervals >48 hours since last 3HP dose was associated with negative tests. Community-based biomarker assessment could provide objective evidence of adherence to weekly 3HP.

OA23-319-20 Preferred short course TB preventive regimens for adults and adolescents living with HIV

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Background: Tuberculosis (TB) is the leading cause of death among people living with HIV (PLHIV). While TB Preventive Therapy (TPT) is recommended, the preferred regimen for PLHIV remains unclear. We conducted a systematic review comparing TPT completion, grade 3&4 adverse events (AEs), TB incidence and HIV viral load suppression (VLS) among HIV-positive adults and adolescents (≥13 years) receiving 1HP, 3HP and 6H.
Design/Methods: We searched Pubmed, Embase and the Cochrane register, January 2014 to November 2024, and relevant conference abstracts (2022-2024); randomized control trials (RCTs) and prospective observational studies were included. For TPT completion, toxicity and VLS, single-armed estimates were compared, and meta-analyses were conducted (random-effects models). For TB incidence analysis was limited to comparative studies as data were insufficient for meta-analysis. Evidence certainty was assessed using GRADE.
Results: We screened 2788 studies; 20 studies (13 RCTs) were included.
Overall TPT completion (n=12731) was 80%; highest with 1HP (97%, 95% CI 96-98%) and 3HP (92%, 90-94%), versus 6H (72%, 62-82%). Grade 3&4 AEs (n=6906) were highest with 6H (15%), versus 1HP (7%) and 3H (5%), but differences were not significant. Grade 3&4 hepatoxicity was lowest with 3HP (0.4%). Across 3 RCTs testing either 1HP or 3HP, TB incidence was similar by regimen. VLS (n=830) was similar with 1HP and 3HP combined (93%) versus 6H (92%, one study).
Among 15300 participants, 105 deaths occurred, 3 attributed to 6H, none to 1HP or 3HP. Certainty of evidence was very low (TPT completion) and low (AEs, incidence and VLS).
Conclusions: Rifapentine-containing TPT regimens for PLHIV should continue to be scaled up. As 3HP is associated with high completion and low AEs, it is well-suited for broad implementation across LMIC settings. While 1HP remains promising, there is an overall need for more high-quality data on relative risks and benefits across different TPT regimens.

OA23-320-20 Factors associated with high CAD scores among people living with HIV screened for TB using digital chest X-ray with computer-aided detection software in Kenya

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Background: Tuberculosis (TB)-HIV co-infection remains a significant global health challenge, with 30% of cases undetected. WHO recommends a chest X-ray (CXR) with optional computer-aided detection software (CAD) as a sensitive tool for TB screening. The National TB program implemented digital CXR with CAD4TB® for individuals aged ≥15 years.
We described characteristics of people living with HIV (PLHIV) screened for TB with digital CXR and factors associated with high CAD scores.
Design/Methods: We conducted a retrospective review of data on the National Digital CXR registry for PLHIV aged ≥ 15 years from 2022 to 2024. An Excel data abstraction tool was used to collect socio-demographic and clinical variables. CAD scores ≥ 60 were considered highly probable for TB. Epi Info® 7.2 was used for analysis with associations assessed by prevalence odds ratio (pOR) and 95% confidence interval (CI).
Results: Among 7,435 PLHIV, 63% were female and mean age 43±12 years. Of these, 7,428 (99%) had symptom screening outcome, with 3880 (52%) TB presumptive. Laboratory testing was performed in 687 (18%) presumptive cases and 286 (8%) asymptomatic individuals. The median CAD score was 7.86 (IQR 3.892-24.8). Laboratory TB positivity for CAD scores above 60 versus below 60 was 11% versus 7% in symptomatic cases and 8% versus 4% in asymptomatic individuals.
High CAD scores were associated with: previous TB history (pOR=5.6, CI:4.7,6.74), male gender (pOR=2.67, CI:2.23,3.18), Symptomatic screening outcome (pOR=2.7, CI:2.22,3.28), smoking (pOR=3.01, CI:2.34,3.88), positive laboratory test (pOR=2.8, CI:1.98,4.01) and TB contact history (pOR=1.58, CI:1.16,2.14).
Conclusions: Digital CXR with CAD effectively identifies high-risk PLHIV for TB, detecting cases even among asymptomatic individuals. Integration of this technology into routine screening could significantly enhance early case detection and improve treatment outcomes.

Our findings support implementation of CAD-assisted digital CXR as a valuable tool in comprehensive TB-HIV management strategies.Future research should focus on evaluating optimal CAD threshold scores for PLHIV.

OA23-321-20 Diagnostic accuracy of Fujifilm SILVAMP TB LAM II for TB in HIV-positive and HIV-negative adults: A multicenter study in Vietnam

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Background: Accurate diagnosis of TB, especially in people living with HIV, is hindered by low sputum bacterial loads. Fujifilm SILVAMP TB LAM II (FujiLAM) is a rapid, urine-based assay detecting lipoarabinomannan (LAM) to enhance TB diagnosis. We evaluated the third-generation FujiLAM assay's diagnostic accuracy in HIV-positive and HIV-negative adults in Vietnam.
Design/Methods: A cross-sectional, multicentre study was conducted from June 2024 to April 2025 at the National Lung Hospital, Hanoi Lung Hospital, Pham Ngoc Thach Hospital, and HIV outpatient clinics in Hanoi and Ho Chi Minh City. FujiLAM was performed on fresh urine samples. Xpert (sputum) was the microbiological reference standard. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and 95% confidence intervals (CI) were calculated. We assessed the inter-assay agreement using Cohen's Kappa.
Results: Among 3,549 participants (498 HIV-positive; 3,051 HIV-negative), FujiLAM sensitivity was 41.2% (95% CI: 18.4–67.1%) in HIV-positive individuals and 27.8% (95% CI: 24.0–32.0%) in HIV-negative individuals against Xpert (sputum). Specificity was 99.6% (95% CI: 98.5–99.9%) among people with HIV and 99.6% (95% CI: 99.3–99.8%) in HIV-negative individuals. In HIV-positive cases, PPV was 77.8% (95% CI: 40.0–97.2%) and NPV was 98.0% (95% CI: 96.3–99.0%).
Overall sensitivity was 28.3% (95% CI: 24.5–32.3%), with an area under the receiver operating characteristic curve of 0.64 (95% CI: 0.62–0.66). Agreement with Xpert was fair (Cohen's Kappa = 0.3908, p<0.001).
Conclusions: FujiLAM exhibits high specificity (99.6%) and moderate sensitivity (41.2%) in HIV-positive adults, indicating potential as a non-invasive adjunct to sputum-based tests like Xpert. Its lower sensitivity (27.8%) in HIV-negative individuals limits broader use.
Similar to other urine-based assays, FujiLAM's relevance is most significant for HIV-associated TB, especially for people unable to produce sputum. Further research is needed to optimize its diagnostic role across diverse populations.

OA23-322-20 Diagnostic accuracy of FujiLAM II point-of-care assay for detecting TB in urine among people with and without HIV in Cameroon

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Background: Rapid, non-sputum-based point-of-care tests to detect TB are urgently needed. The third-generation urine lateral flow-based test, the SILVAMP TB LAM II assay (FujiLAM II, Fujifilm, Japan) is an updated version of the FujiLAM test that has potential for point-of-care detection of TB. We evaluated the diagnostic accuracy of FujiLAM II as part of the multi-country Start4All project.
Design/Methods: We conducted a prospective, multicenter diagnostic study among hospital and primary care outpatients and people attending community health camps in Cameroon. Eligible participants were ≥15 years with two or more symptoms of TB and/or an abnormal chest X-ray. All participants provided two sputum specimens for Xpert MTB/RIF Ultra (Ultra) testing and urine for FujiLAM II testing.
The reference standard included sputum Ultra and sputum liquid and solid culture to determine sensitivity and specificity of FujiLAM II.
Results: From Dec 2023 to Feb 2025, 2,038 hospital outpatients, including 540 (26%) people living with HIV, 1,498 (74%) HIV-negative participants, and 766 people attending community health camps, were enrolled and had results. In preliminary analyses, TB was confirmed by sputum Xpert MTB/RIF Ultra in 229 (11%) of outpatients and 45 (6%) of people in the community.
As compared to sputum Ultra, FujiLAM II sensitivity in HIV-positive outpatients was 51% (27/53, 95% CI 38-64%), in HIV-negative outpatients 49% (87/176, 95% CI 42-57%), and in community participants 31% (14/45, 95%

CI 20-46%); overall specificity was 98.5% (2,491/2,530, 95% CI 97.9-98.9%). Analyses compared to the full reference standard, including culture, are ongoing.
Conclusions: The similar sensitivity of the FujiLAM II assay in HIV-negative (49%) as compared to HIV-positive (51%) outpatients in this study suggests that these tests have good general promise, although the performance falls below the WHO target product profile of 65% for a non-sputum point-of-care test.

OA23-323-20 Tongue swab based targeted universal TB testing in people living with HIV in KwaZulu-Natal, South Africa

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Background: Targeted Universal Tuberculosis Testing (TUTT) may increase case detection to include asymptomatic people who are at high risk of disease. Tongue swab (TS) testing may facilitate TUTT because swabs are easy to collect and have worked well detecting tuberculosis (TB) in people with TB symptoms. However, there is limited data on TS accuracy for TB detection in people with asymptomatic TB and non-TB-care seekers. We evaluated the diagnostic accuracy of two high-sensitivity TS testing protocols in adults with HIV screened irrespective of symptoms.
Design/Methods: Study staff collected Copan FLOQSwab (N=161) and Medline pint-size foam-swab tongue specimens (N=196), alongside urine (N=249) and sputa, from people with HIV (N=252) presenting for antiretroviral therapy initiation at primary healthcare clinics in KwaZulu-Natal, South Africa. FLOQSwabs were processed and tested by sequence-specific magnetic capture (SSMaC) with qPCR. Foam swabs were processed and tested by centrifuge-sedimentation and high-volume qPCR. Urine lipoarabinomannan was detected by Alere LF-LAM. Sputa were tested by Xpert Ultra and MGIT culture as the microbiological reference standard (MRS).
Results: Participants were enrolled with (67%) or without (33%) self-reported TB symptoms. Participants had a median CD4 count of 346 (IQR 182-551), and 16% (40/252) had prior TB. Foam swabs were 43% (95% CI: 22-66%, 9/21) sensitive and 100% (95% CI: 98-100%, 175/175) specific. FLOQSwabs were 41% (95% CI: 24-59%, 13/32) sensitive and 100% (95% CI: 97-100%, 129/129) specific. When either TS detected TB, overall sensitivity of TS testing was 53% (95% CI: 29-76%, 10/19). Urine LAM detection was 18% (95% CI: 7-35%, 6/34) sensitive and 97% (95% CI: 93-99%, 208/215) specific. Sensitivity increased to 52% (FLOQSwab) and 53% (foam) if MRS Trace Xpert results were categorized as negative.

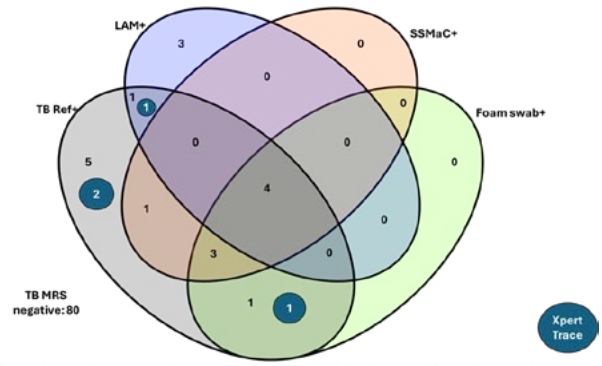

Figure: Venn diagram showing overlap of sample positivity from N=102 participants with urine and both swab types collected.

Conclusions: High-sensitivity laboratory methods enabled the detection of participants with TB using a non-sputum specimen in this active case-finding context. Swab testing outperformed urine LAM testing in this cohort.

OA23-324-20 A randomised-controlled trial comparing C-reactive protein- to symptom-based TB screening of people with HIV in Uganda: Primary 24-month effectiveness results

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Background: Since 2021, WHO has recommended C-reactive protein (CRP) for TB screening in people with HIV (PWH) due to its demonstrated higher specificity than the WHO 4-part symptom screen (W4SS), the current standard. However, the long-term benefits of CRP relative to W4SS screening remain unknown.

Design/Methods: We enrolled adults initiating antiretroviral therapy (ART) in four clinics in Uganda in a phase 3, partially-blinded, individual randomized trial (NCT04557176). The trial compared point-of-care CRP against W4SS; outcomes included: combined 2-year TB incidence and all-cause mortality (primary), microbiologically-confirmed TB prevalence, and proportions initiating TB preventive therapy (TPT). Screen-positive participants (CRP≥5 mg/L or ≥1 TB symptom, according to randomization arm) underwent confirmatory testing (urine LAM ± sputum Xpert Ultra). Eligible screen-negative participants were referred for 3HP (3-month weekly isoniazid + rifapentine).

Results: Among 1719 participants, the proportion screening positive for TB at enrollment was lower in the CRP arm than the W4SS arm (37.1% [319/861] vs. 64.3% [552/858], p<0.01). However, CRP and W4SS detected a similar proportion of participants with prevalent TB (8.4% [72] vs. 7.7% [66], p=0.61). Consequently, the proportion eligible for (46.7% vs. 24.4%, p<0.01) and initiating 3HP (41.8% vs. 22.5%, p<0.01) was higher in the CRP arm. Overall, 108 (6.3%) participants experienced a primary outcome (incident TB or death) over 3,346 person-years of follow-up, including 50 (5.8%) in the CRP arm and 58 (6.8%) in the W4SS arm (p=0.42). Risk of TB or death was lower in the CRP arm than the W4SS arm (hazard ratio 0.87), although the 95% CI was wide (0.60-1.27, p=0.48).

Table. Baseline clinical characteristics and TB screening outcomes of ART-naïve PWH, by TB screening strategy.

	Total (n=1,719)	CRP (n=861)	W4SS (n=858)	p-value
Female sex	1,076 (62.6%)	536 (62.3%)	540 (62.9%)	
Age, median years (IQR)	30 (25-37)	30 (25-38)	30 (25-37)	
Pre-ART CD4, median cells/mm^3 (IQR)	231 (107-365)	230 (106-372)	233 (109-363)	
TB screen-positive	871 (50.7%)	319 (37.1%)	552 (64.3%)	<0.01
Prevalent TB detected by screening[1]	138 (8.0%)	72 (8.4%)	66 (7.7%)	0.61
TB screen-negative	848 (49.3%)	542 (63.0%)	306 (35.7%)	<0.01
Eligible for 3HP[2, 3]	611 (35.5%)	402 (46.7%)	209 (24.4%)	<0.01
Initiated 3HP[2]	553 (32.2%)	360 (41.8%)	193 (22.5%)	<0.01
Received non-study TPT[4]	280 (16.3%)	106 (12.3%)	174 (20.3%)	<0.01
Time under observation, person-years	3,346	1,668	1,678	
Primary outcome: Incident TB or death	108 (6.3%)	50 (5.8%)	58 (6.8%)	0.42
Incidence rate of TB and death	3.23 (2.67-3.90)	2.98 (2.26-3.93)	3.48 (2.69-4.50)	0.42

Abbreviations: TB (tuberculosis); ART (antiviral therapy); PWH (people with HIV); CRP (C-reactive protein); W4SS (WHO 4-part symptom screen); IQR (interquartile range); 3HP (3 weeks of weekly isoniazid + rifapentine); TPT (TB preventive therapy). *Legend:* [1]Prevalent TB diagnosed by urine lipoarabinomannan (LAM) or sputum Xpert Ultra; [2]Among participants who screened negative; [3]Contraindications to 3HP included liver disease (liver enzymes ≥ 3-times the upper limit of normal, hepatitis, binge or heavy alcohol consumption), pregnancy, <3 months postpartum, planning to become pregnant, breastfeeding, contact with TB patient with known isoniazid or rifamycin resistance, known isoniazid or rifamycin allergy, drug contraindication; [4]Non-study TPT regimen (238 received 6 months of daily isoniazid and 42 received 3HP).

Conclusions: Among ART-naïve PWH, CRP-based TB screening did not reduce 2-year TB incidence and death compared to symptom screening. CRP was, however, able to detect a similar proportion with prevalent TB, while enabling twice as many PWH to initiate 3HP. These results support scale-up of CRP-based screening among ART-naïve PWH.

OA23-325-20 Early adherence trajectories predict six-month outcomes in people living with HIV and multi-drug-resistant TB: Findings from the PRAXIS study

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Background: Challenges to multidrug-resistant tuberculosis (MDR-TB) treatment remain a major barrier to successful outcomes among people living with HIV, who often face complex regimens and structural barriers to care. Identifying individuals at risk for poor outcomes is essential to guide differentiated service delivery. We used latent class growth analysis (LCGA) to identify early adherence trajectories and assess their association with six-month outcomes in the PRAXIS study.

Design/Methods: This prospective cohort included South African adults with HIV and MDR-TB (NCT03162107) treated with bedaquiline (BDQ)-based regimens and antiretroviral therapy (ART) from 2016 to 2020. Daily BDQ adherence data from the first 6 months of treatment were measured using a cellular-enabled electronic dose monitor (Wisepill RT2000). LCGA was applied on the first 4 weeks of adherence data from 283 individuals to identify distinct adherence patterns. Model selection was based on Bayesian Information Criterion, entropy, and class size ≥10% of the sample. Using Kaplan-Meier curves and log-rank tests, we evaluated associations between adherence class and six-month outcomes, including mortality, favorable MDR-TB treatment response, and total 6-month BDQ/ART adherence.

Results: The three-class model was selected based on fit statistics (lowest BIC and high entropy). Three distinct classes emerged: Class 1 (n=33, 17%) showed steadily declining adherence, Class 2 (n=77, 39%) had stable, moderate adherence, and Class 3 (n=173, 44%) demonstrated consistently high adherence. Class 1 had significantly worse six-month outcomes, including lower ART

and BDQ adherence (p<0.001), higher mortality (36%, p=0.001), and lower rates of favorable treatment outcomes (55%, p=0.023). Kaplan-Meier analysis confirmed significant differences in survival and treatment success across classes.

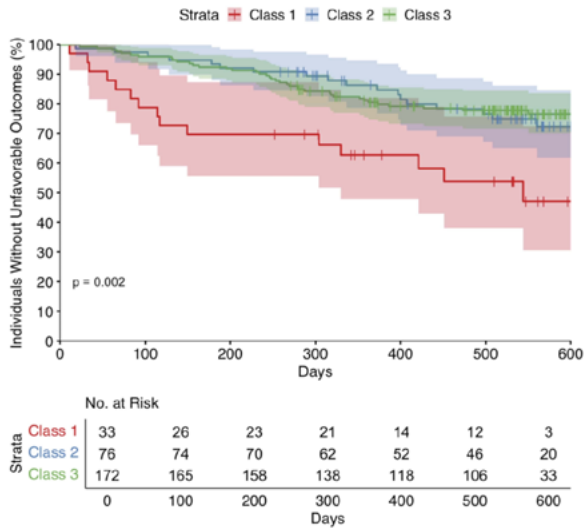

Figure 1: Probability of Favorable Outcome Over Time Stratified by Latent Class Membership

Conclusions: Weekly adherence during the first four weeks of treatment strongly predicted six-month outcomes. Incorporating early adherence data into differential service delivery models may enable the timely identification of high-risk patients, allowing for targeted interventions to improve outcomes for people living with HIV and MDR-TB.

OA23-326-20 HIV incidence among people with TB in Israel: A 42-years follow up study

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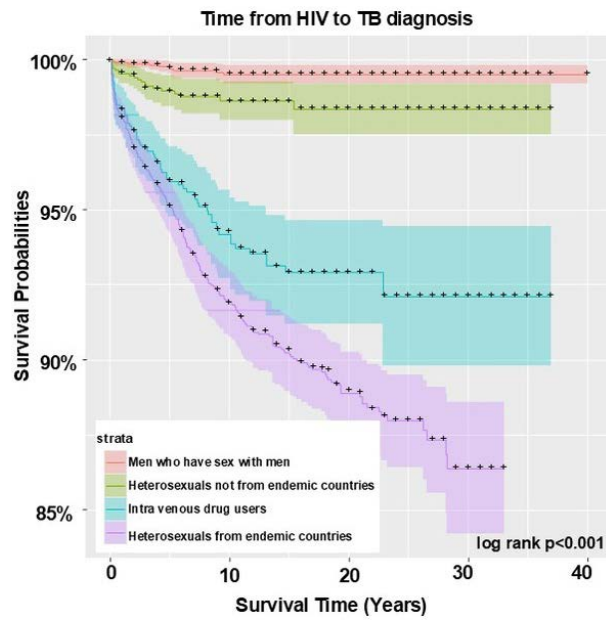
Background: HIV/tuberculosis co-infection raises the risk of negative outcomes and death. This 42-years longitudinal study describes tuberculosis incidence in people living with HIV (PLHIV) in Israel, a low tuberculosis incidence country, and identifies populations at high-risk for developing tuberculosis.
Design/Methods: This study includes all tuberculosis cases reported in Israel more than one month following HIV-diagnosis between 1981 and 2023. Cox regression models adjusted for the length of follow-up were divided into three timeframes, in accordance with the availability and quality of anti-retroviral treatment (ART): 1981-1996 (pre-ART), 1997-2016 (ART), 2017-2023 (improved ART). Independent variables that were associated with tuberculosis-incidence were presented by hazard ratio (HR) and 95% confidence interval (CI).
Results: During the study period, 12,004 PLHIV were reported in Israel, of whom 413 (3.4%) developed tuberculosis: 132 (7.4%) developed tuberculosis among 1,782 PLHIV between 1981 and 1996, 263 cases (3.6%) among 7,386 PLHIV between 1997 and 2016, and 18 cases (0.6%) among 2,836 PLHIV between 2017 and 2023 (p<0.001). Tuberculosis cases diagnosed in 1981-1996 and 1997-2016 were more commonly older (p<0.001) and more likely were non-Israeli born (p<0.001) than those diagnosed in 2017-2023. Cox regression model demonstrated that males (HR=1.5, 95% CI: 1.2-1.9, p<0.001) and non-Israeli born PLHIV (HR=2.2, 95% CI: 1.3-3.8, p=0.001) were at higher risk for developing tuberculosis compared to Israeli-born PLHIV (Figure).



The highest risk for tuberculosis was observed among heterosexuals originating in endemic countries (HR=9.0, 95% CI: 2.8-28.6, p<0.001), followed by intravenous drug users (IVDU) (HR=6.9, 95% CI: 2.1-22.0, p=0.001). Interestingly, a decline in HR for developing tuberculosis among PLHIV was observed between the different timeframes: 80% reduction in 2017-2023 and 58% reduction in 1997-2016 compared with 1981-1996.
Conclusions: Tuberculosis incidence among PLHIV was highest among males and migrants from endemic countries, followed by IVDU. Tuberculosis incidence declined after ART was introduced and was further reduced when ART was improved.

OA24 Sustainability in demand: Feasibility, acceptability, cost effectiveness, and TB care approaches

OA24-327-20 Evaluation of a fluorescence immunoassay-based IGRA for latent TB diagnosis: A simplified, cost-effective alternative

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Background: Approximately one-quarter of the global population is infected with Latent tuberculosis infection (LTBI), with 5–10% of infected individuals at risk of developing active tuberculosis (TB). Interferon-Gamma Release Assays (IGRAs) are effective in diagnosing LTBI, yet the high costs and complexity of ELISA assays restrict their use.
To address this, the study evaluated the performance of a qualitative fluorescence immunoassay (FIA) to detect IFN-γ (Interferon gamma, ichroma IGRA-TB), a cost-effective and simpler alternative method.
Design/Methods: A total of 300 participants from TB Screening and Treatment Centres of icddr,b are being enrolled since December 15, 2024. Participants are categorized into four risk groups: healthy individuals, contacts of TB patients, patients with microbiologically confirmed TB, and individuals with prior TB history. The diagnostic performance ichroma IGRA-TB, will be compared with QuantiFERON-TB Gold Plus (QFT) across these groups. Initial enrollment and test results were available for 160 participants.
Results: The overall agreement between ichroma IGRA-TB and QFT is 85.62% (95% CI: 79.22–90.66%). The highest agreement is observed among TB patient contacts (90.00%, 95% CI: 76.34–97.21%), individuals with prior TB history (90.91%, 95% CI: 58.72–99.77%), and healthy individuals (88.37%, 95% CI: 74.92–96.11%). The lowest agreement is seen in active TB cases (80.30%, 95% CI: 68.68–89.07%). Among contacts of TB patients, who are most likely to have LTBI, ichroma has a sensitivity of 93.33%, specificity of 88.0%, and a kappa value of 0.8.
Conclusions: Ichroma IGRA-TB demonstrates strong agreement with the costlier and more complex QFT. It has excellent performance among TB contacts and individuals with prior TB episodes. However, agreement among active TB cases remains lower, mirroring findings for currently established IGRA assays. With lower infrastructure constraints, minimal training requirements and faster results, ichroma IGRA-TB represents a cost-effective LTBI diagnostic alternative for resource-limited settings.

OA24-328-20 Consideration of risks and consequences of TB and its prevention in cost-utility analyses among immigrants to low incidence countries: A systematic review

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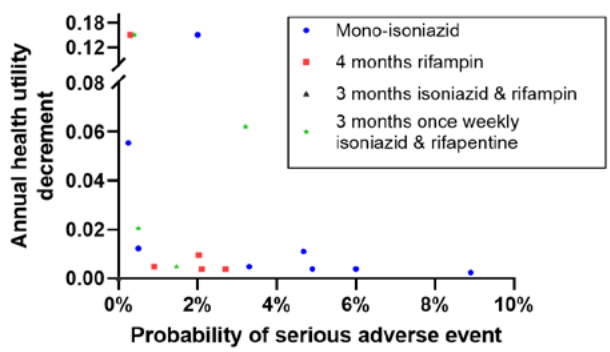
Background: Foreign-born populations bear much of the tuberculosis (TB) burden in many low TB incidence countries, largely because of the progression of TB infection. However, there are divergent conclusions regarding the cost-utility of TB infection treatment programs among immigrants. To investigate why conclusions may differ, we evaluated how cost-utility analyses have considered the risks and consequences of TB disease and tuberculosis preventive treatment (TPT) among immigrants to low-incidence countries.
Design/Methods: A systematic search was conducted in PubMed and Embase from January 1, 2004, to March 25, 2025. Studies were included if they were modeling studies, measured health utility in the form of quality-adjusted life years (QALYs), and evaluated TPT among immigrants to low TB incidence countries. A narrative synthesis was performed, examining how studies considered risks and consequences of TB disease and TPT, and their attendant impacts on health disutility.
Results: The search identified 5,142 records. After title and abstract review, 32 studies were left for full-text review, and 16 were ultimately included. The most commonly considered consequence of TPT was major adverse events (AEs). Thirteen of sixteen studies considered risks of major AE, which ranged from 0.1% to 8.9%; the average health disutility was 0.028 QALYs, but varied substantially, with a coefficient of variation of 1.56 (Figure).
All studies considered health disutility associated with TB disease. Annual disutility ranged from 0.04 to 0.28, with an average impact of 0.13 and a coefficient of variation of 0.5. Four studies considered post-TB consequences in their primary analysis.



Conclusions: There is wide variation in how risks and consequences of both TPT and TB disease are considered in studies evaluating TB infection treatment pro-

grams. This lack of standardization in how risks and consequences are quantified, may be a significant contributor to the inconsistent conclusions surrounding the cost-effectiveness of immigrant TB infection treatment programs.

OA24-329-20 Cost and cost-effectiveness of household contact investigation of pulmonary bacteriologically confirmed people with TB in sub-Saharan Africa

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Background: This study aimed to evaluate the costs and cost-effectiveness of household contact investigation compared to routine passive case-finding in TB clinics across five sub-Saharan African countries: Burkina Faso, Central African Republic, Guinea, Niger, and Togo.

Design/Methods: A comparative approach was used to assess two TB case identification strategies. Household contact investigation through home visits was implemented in 11 intervention sites across the countries. In 11 control sites, routine passive case-finding was practiced, where nurses advised TB index patients to refer their household contacts to the TB clinic for screening.

Costs were collected for six key activities (training, home visits, screening, case follow-up, and supervision) and analyzed using a micro-costing approach. Effectiveness was measured by the number of TB cases treated and pediatric contacts placed on TB preventive treatment. Incremental cost-effectiveness ratios (ICERs) were calculated for each outcome indicator.

Results: The total cost of activities was € 68.129,63 in the intervention sites compared to € 27.541,26 in the control sites (Table 1), with country-specific variations (Table 2). Contact investigation resulted in the treatment of 1,477 TB cases in the intervention sites, versus 565 in the control sites (Table 3).

Additionally, 997 children under five years received TB preventive treatment in intervention sites, compared to 236 children in control sites (Table 3). ICER analysis indicated a cost of €44.50 per TB case treated and €53.34 per child placed on preventive treatment with the active strategy (Tables 4 and 5).

Table 1: Descriptive analysis of costs by component and according to the studied strategies.

Cost per component	Intervention	Control
Initial training	10426,10	0
Data collection and feedback	827,29	827,29
Home visit	1922,89	39,89
Case screening	27447,32	10127,31
Case follow-up	17842,69	6883,42
Supervision	9663,35	9663,35
Total	68129,63	27541,26

Table 2: Differential costs of activities between intervention and control CDTs, and ICER of key indicators for each of the five study countries.

Component	Initial training	Data collection and feedback	Home visit	Case screening	Case follow-up	Supervision	Total
Burkina Faso							
Intervention	3 160,88	142,66	245,87	3 614,92	2 556,89	2 050,51	11 771,73
Control	-	142,66	33,00	2 668,05	1 920,54	2 050,51	6 814,76
CAR							
Intervention	2 321,03	193,43	290,49	5 098,12	3 510,11	183,26	11 596,43
Control		193,43	-	1 050,31	717,79	183,26	2 144,79
Guinea							
Intervention	1 832,00	204,00	329,11	9 760,12	5 933,11	1 676,00	19 734,34
Control	-	204,00	6,89	1 033,79	676,27	1 676,00	3 596,95
Niger							
Intervention	1 551,00	143,50	268,60	6 015,16	3 774,18	2 781,00	14 533,45
Control	-	143,50	-	3 701,57	2 388,71	2 781,00	9 014,78
Togo							
Intervention	1 561,19	143,70	788,82	2 959,00	2 068,40	2 972,58	10 493,68
Control	-	143,70	-	1 673,59	1 180,11	2 972,58	5 969,98

Table 3 : Descriptive analysis of effectiveness results based on the different strategies.

RESULTS	Intervention	Control
Number of TB cases on TB treatment	1477	565
Number of children < 5 years on TB preventive treatment	997	236
Number of PLHIV on TB treatment	6	1
Number of PLHIV TB preventive treatment	0	0

PLHIV = People Living with HIV

Table 4: Differential costs in euros of activities between intervention and control CDTs, and ICER of key indicators.

COST-EFFECTIVENESS		Value
Cost difference (euros)		40588,37
Difference in TB cases identified (N)		912
Difference in children < 5 years on TB preventive treatment (N)		761
Incremental cost (ICER)	TB cases identified through Contact Investigation	44,50
	Children < 5 years on TB preventive treatment	53,34

Table 5: Differential costs in euros of activities between intervention and control sites, and ICER of key indicators by country.

		Country				
		Burkina Faso	**Niger**	**Guinée**	**Togo**	**RCA**
Cost difference (euros)		4956,97	5518,67	16137,39	4523,70	9451,65
TB cases identified through contact investigation	Case difference (N)	149	259	955	154	96
	Cost per index case (ICER, euros)	33,27	21,31	16,90	29,37	98,45
Child < 5 years on TB preventive treatment	Case difference	48	179	443	28	63
	Cost per child under 5 (ICER, euros)	103,27	30,83	36,43	161,56	150,03

Conclusions: Despite higher initial costs, household contact investigation was a cost-effective and efficient strategy for improving TB detection and management, particularly among vulnerable populations. The comparison underscores the limitations of relying solely on passive referral systems. Country-level cost disparities highlight the role of logistical and contextual factors. National TB programs should consider integrating this proactive approach to strengthen TB control in sub-Saharan Africa.

OA24-330-20 Evaluating the effectiveness of the PDX machine in improving sample quality and reducing costs in TB sample processing in Ekiti State

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Background: The portable digital Xray (PDX) machine has emerged as a promising tool for enhancing sample quality and reducing costs. This study aimed to evaluate the effectiveness of the PDX machine in tuberculosis (TB) screening. The specific objectives are to: assess the performance of the PDX machine in detecting TB cases, compare the effectiveness of the PDX machine with conventional TB screening methods of community tuberculosis screening application (COMMTB app) and to evaluate the ability of the PDX machine to detect asymptomatic TB cases. The hypothesis set was that the PDX machine would improve sample quality and reduce costs in sample processing. The challenge addressed was the need for accurate and efficient TB screening methods, particularly in resource-constrained settings.
Design/Methods: The study employed a comparative design, using the PDX machine and CommTB to screen 1455 individuals for tuberculosis in a targeted locations in Ado. Sputum Samples were collected from presumptive individuals and transported in an ice pack into the GeneXpert laboratory. Samples were analyzed for TB, and positive cases were confirmed using Xpert and X-ray. Data were compared to evaluate the performance of the PDX machine and the CommTB. The desired outcome was to demonstrate the effectiveness of the PDX machine in improving sample quality, reducing costs, and detecting asymptomatic TB cases.
Results: The PDX machine detected 105 presumptive TB cases, 12 confirmed positive cases (3 Xpert-confirmed, 9 X-ray suggestive). In contrast, 208 presumptive were detected with CommTB out of which 2 positive cases were confirmed. Notably, the PDX machine identified asymptomatic presumptive cases that were missed by CommTB.
Conclusions: This study demonstrates the effectiveness of the PDX machine in improving sample quality, reducing costs, and detecting asymptomatic TB cases. The findings support the adoption of the PDX machine as a valuable tool in TB prevention programs, particularly in resource-constrained settings.

OA24-331-20 DronEconomics: The cost of implementing drones to facilitate TB sputum sample collection in hard-to-reach areas in Nepal

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Background: The use of innovative technologies like drones in healthcare is ever-rising. In Nepal, Birat Nepal Medical Trust (BNMT) had piloted the Drone Optimized Therapy System (DrOTS) project which used drones to transport sputum samples for Tuberculosis (TB) diagnosis in a remote district, Pyuthan. Our previous findings suggested that drone transport reduced average travel time from 2.3 hours of walking to just 6.25 minutes. This study aimed to assess the program's financial implications and inform the potential scale up.
Design/Methods: We conducted a cost of implementation study and estimated the financial costs associated with using drone-based transportation. The analysis was performed from the implementer's perspective over the project duration of 13 months. We employed top-down costing approach to calculate cost per flight and cost per sputum sample transported. We conducted sensitivity analysis to assess how variations in key assumptions would affect the outcome.
Results: The total cost of implementation was estimated at $186,215, with a unit cost of $846 per flight and $246 per sputum sample collected. Capital costs (project initiation, training and infrastructure development costs) accounted for 54% of the total costs, while ACF field implementation cost was 30%, drone operation costs (drone equipment, accessories and operator salaries) accounted for 16%.
Based on the sensitivity analysis, including only recurring costs and increasing flight frequency to 2 flights per day, the cost per flight is reduced by over 80%.
Conclusions: The use of drones for sputum transport in remote communities in Pyuthan is feasible but costs are currently highly driven by capital and start-up costs. However, sensitivity analysis demonstrates that significant cost reductions can be achieved by increasing operation intensity and continuing the implementation by prioritizing use of local human resources. There is a need to secure long-term funding to ensure uninterrupted operation and optimize resource allocation to maximise the potential benefits.

OA24-332-20 Testing more for less: Evidence on pooling specimens for molecular testing at healthcare facilities and by active case finding in communities across seven high-burden countries

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Background: In 2023, 48% of people with TB received an initial rapid molecular diagnostic (RMD) test. Specimen pooling can expand access to RMD, combating high costs, supply limitations, and funding constraints. With TB and infectious diseases expertise, pooling is set for WHO guidelines evaluation. We assessed the accuracy of pooling sputum for TB testing by Xpert Ultra.
Design/Methods: Start4All recruited individuals at primary and secondary level facilities, and through active case finding (ACF) in Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Vietnam.
In facilities, sputum was collected and tested in the same facility. ACF samples were transported to the nearest affiliated laboratory. All specimens were tested individually, and in pools of 2-4. Standard procedure was followed for individual testing. For pooling, an equal volume of individual samples was mixed and 2ml of the pool was then tested. Sensitivity and specificity were estimated at the pool level and by screening approach. The number of people with TB missed using pooling was calculated and potential cartridge savings modelled.
Results: Overall, 13,038 specimens were tested individually and in 3,389 pools. 1,069 (8.2%) people had TB on individual testing. Most pools (88.2% n=2,989) contained four samples. About 77% of pools had no individually positive specimens. The sensitivity of pools tested at district labs, primary care, and ACF was 94.3% (95% CI:91.3,96.8), 95.8% (95% CI: 92.7,98.2) and 80.9% (95% CI: 72.5,87.9), respectively. Specificity ranged from 99.1% to 99.9%. Pooled testing missed 52 (4.9%) people with TB and used 48.9% of potential tests if every sample was tested individually.
Conclusions: Pooled testing using Xpert Ultra has high performance and lower cost per person tested, meeting WHO accuracy thresholds in screening test target product profiles. Our results suggest that scale-up of pooling can lead to cost savings and expanded access to RMD in high burden settings.

OA24-333-20 Pooled testing for TB: A cost-saving strategy with trade-offs in detection sensitivity

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Background: Pooled testing involves combining specimens from multiple individuals and testing the pooled specimen via a two-step process that foregoes individual testing in the event of negative pooled test results. A limited number of studies have assessed the diagnostic accuracy of pooled testing for TB.
Design/Methods: Adult participants were screened and tested across two settings in Vietnam. During community-based screening, people with symptoms and/or an abnormal chest X-ray were indicated for testing, whereas only those with a cough were indicated for testing during facility-based screening. Sputum specimens from eligible people were first individually tested with the Xpert MTB/RIF Ultra assay (Ultra). Remnant specimens were then combined into pools of four and tested for a second time on Ultra. The workload savings and diagnostic accuracy of an upfront pooled testing strategy were modelled.
Results: 2,264 people were individually tested with Ultra, with 119 (5.3%) having a MTB positive result. 566 four-specimen pools were tested on Ultra in parallel, with 83 (14.7%) having a MTB positive result. Ultra testing volumes would have been reduced by -60.3% if pooled testing had been done upfront (-69.1% vs -38.4% for community- vs facility-based screening). However, upfront

pooled testing would have missed 21 (17.6%) individuals who could have been diagnosed via individual testing (20.0% and 16.9% during community- and facility-based screening). The majority of the missed TB diagnoses during upfront pooled testing had a Trace semiquantitative grade (n=15, 71.4%) with no history of TB.

	Community	Facility	Both Settings
Individual Ultra tests performed	1,620	644	2,264
MTB positive results from individual testing	30 (1.9%)	89 (13.8%)	119 (5.3%)
Pooled Ultra tests performed	405	161	566
MTB positive results from pooled testing	24 (5.9%)	59 (36.6%)	83 (14.7%)
Tests required for upfront pooled testing	501	397	898
Savings relative to individual testing	-69.1%	-38.4%	-60.3%
Missed TB diagnoses	6 (20.0%)	15 (16.9%)	21 (17.6%)

Table.

Conclusions: Pooled testing can significantly reduce the workload and costs of diagnostic testing for TB. However, these savings should be reinvested to expand screening and testing coverage to offset the reduction in TB detection associated with this approach. Pooled testing may not be appropriate in settings where early and sensitive detection of all people with TB is vital.

OA24-334-20 Implementation of targeted next-generation sequencing for drug-resistant TB detection in Indonesia

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Background and challenges to implementation: Drug-resistant tuberculosis (DRTB) remains a significant public health concern. In Indonesia, delayed DRTB diagnosis leads to delayed treatment, more severe disease, and a higher risk of mortality. Moreover, current diagnostic tools for DRTB remain limited as they have long turnaround times and minimal drug resistance coverage.
Intervention or response: The World Health Organization (WHO) recommends targeted Next-Generation Sequencing (tNGS) for rapid DRTB detection. To assess its feasibility and potential scalability in DRTB routine diagnostic settings, we conducted a pilot tNGS implementation using the Deeplex MycTB™ in West Java, Indonesia. We also compared the tNGS costs with phenotypic drug susceptibility testing (pDST). Multiple strategic efforts were undertaken to support its adoption, including stakeholder engagement, laboratory training and optimisation, diagnostic network expansion, and continuous monitoring and evaluation.
Results/Impact: 328/402 (82%) clinical samples were successfully sequenced using tNGS from August 2024 to March 2025. It took a median of 8 days (IQR 6-12) from sample receipt by laboratory to the tNGS result, indicating a faster diagnostic turnaround time than conventional methods. Clinicians and laboratory technicians also showed a positive attitude toward tNGS utilisation and recognized its potential to guide treatment decisions.
Although the operational performance of tNGS was considered good, tNGS costs remain a significant barrier. The average cost per sample for PDST was $104.36, while the tNGS cost per sample reached $254.85. Its adoption is further hindered as tNGS has not yet been integrated into national DRTB guidelines. Meanwhile, laboratory technicians highlighted the need for workflow optimisation and improved access to essential laboratory equipment, particularly to address poor-quality samples.
Conclusions: tNGS shows strong potential to be a rapid genomic diagnostic tool in detecting DRTB. However, addressing the identified barriers is critical to ensure its successful integration into routine diagnostic settings.

OA24-335-20 Cost-effectiveness of targeted next-generation sequencing for TB drug-resistance testing as an alternative to the standard of care in South Africa

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Background: South Africa faces emerging resistance to TB drugs like bedaquiline. Phenotypic drug susceptibility testing (DST), the current reference standard for bedaquiline DST, has long turnaround times. Targeted next-generation sequencing (tNGS) offers a comprehensive

alternative, potentially delivering faster results. However, these advantages must be weighed against differences in cost and test accuracy.

Design/Methods: We used a decision tree model to evaluate the cost-effectiveness of tNGS against the standard of care (SOC) in South Africa across different levels of tNGS decentralization (1, 3,4 and 6 sites). Key outcomes included survival rates, time to a correct resistance profile, infectious time, and disability-adjusted life years (DALYs). Sensitivity analyses assessed the impact of drug resistance prevalence, tNGS sensitivity, and improved DST access on overall cost-effectiveness.

Results: tNGS averted 408 DALYs and correctly identified 90.7% of resistance profiles as compared to 87.7% with SOC. Based on model assumptions for South Africa, tNGS had a reduced turnaround time and averted 97 years of infectious time. Centralized tNGS was cost-saving relative to SOC, however decentralization of tNGS resulted in higher costs per DALY averted ($671- $2,454). tNGS outcomes improved at higher bedaquiline resistance and with increased sensitivity relative to the SOC. Any increase in DST access through tNGS improved cost-effectiveness in decentralized scenarios.

DST Algorithm (cost per test)	Total Cost ($) (Range)	Total DALYs (Range)	Incremental cost per DALY averted
Xpert + pDST ($137)	$1.3m ($1,333,883 - $ 1,334,147)	70,893 (70,840 – 71,077)	-
tNGS (1 site, $102)	$1.1m ($1,107,951 – $1,108,319)	70,485 (70,431 – 70,643)	Cost-Saving
tNGS (3 sites, $148)	$1.6m ($ 1,607,618-$ 1,608,106)		$671
tNGS (4 sites, $171)	$1.8m ($1,857,699 - $1,858,282)		$1,283
tNGS (6 sites, $215)	$2.3m ($2,335,511 - $2,336,233)		$2,454

Table 1: Results of cost-effectiveness analysis

Conclusions: tNGS could be cost-saving (centralised) or cost-effective (decentralised) in South Africa and has the potential to improve patient outcomes by returning a greater number of correct results in a shorter time. This analysis should be replicated across other settings to evaluate the broader feasibility of tNGS for DST.

OA24-336-20 Evaluating feasibility and acceptability of TB screening and diagnostic tests: A qualitative study across seven high-burden low- and middle-income countries in the Start4All project

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Background: Despite advancements in tuberculosis (TB) diagnostics, timely detection remains a challenge in many high-burden, low- and middle-income countries. The Unitaid-funded, seven-country Start4All project aims to evaluate the practicality of implementing novel TB tests and associated sample types in real-world healthcare settings (feasibility) and how they are perceived/experienced by healthcare providers and clients (acceptability).

Design/Methods: Start4All conducted a qualitative study in Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Viet Nam, including 7 focus group discussions (FGDs) with people with TB, 11 FGDs with healthcare providers, and 32 in-country and 6 international key informant interviews with TB diagnosis and care experts. We analyzed data thematically to explore perceived feasibility (using Klaic's, Barker's, and French's feasibility frameworks) and acceptability (using Sekhon's acceptability framework) of TB tests and associated sample types, including molecular diagnostics, chest x-rays (CXR) with and without computer-aided detection (CAD), urine-based tests, blood-based tests (capillary fingerpick and venous) and pooled sputum testing.

Results: Clear testing procedures, adequate infrastructure and staffing facilitated feasibility. Urine-based and finger-prick blood rapid tests were viewed as highly feasible due to quick turnaround, minimal equipment needs, and easy workflow integration. CXR with CAD was considered efficient for screening but limited by rural access. Pooled sputum testing was viewed as cost-effective in high-volume settings, but with operational challenges including additional laboratory processes. Technical demands made machine-based venous blood tests least feasible.
Urine and finger-prick blood were widely accepted for ease and comfort. Sputum remained the standard of care but limited by some people not being able to produce sputum. Overall, healthcare providers and community engagement were perceived as key to acceptability.
Conclusions: Aligning procedures with local service delivery models and resource levels was seen as critical to successful integration of new tests for screening and diagnosis into national TB programs to improve early detection and treatment outcomes.

SHORT ORAL ABSTRACT SESSION (OA)

SOA08 New TB diagnostics in the pipeline

SOA08-582-20 'Sputum is King', but other TB diagnostics are gaining ground: Exploring perceptions of specimens for TB testing in South Africa through the TUTTPlus study

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Background: Tongue swabs are a promising, non-invasive alternative for TB testing, as they are potentially simpler and safer to collect than sputum. However, client and provider perceptions for specimen type and diagnostic processes for TB testing have not been widely canvassed. This study explored the acceptability and preferences of tongue swabs compared to other methods TB testing among healthcare providers (HCPs) and clients in South Africa.
Design/Methods: As part of a tongue swab diagnostic yield study (TUTTPlus), six focus group discussions with HCPs and 24 in-depth interviews with clients were conducted across ten primary-care facilities, in three provinces, South Africa. Participants reflected on experiences and preferences related to TB testing specimens and methods. Data were coded and thematically co-analysed using ATLAS.ti.
Results: Many clients preferred blood or chest x-rays for their perceived ability to detect other conditions beyond TB, with some saying, "*blood can show other diseases*" and "*you get to check everything*". The urine LAM test was considered non-invasive by HCPs but sparked doubt among clients about its ability to test for TB, "*normally used to test for pregnancy*". As a novel concept, tongue swabs were generally widely appreciated for being easy, fast, and more private than sputum. However, clients also raised issues of trust and reliability, "*how can you check TB from the tip of the tongue?*".
While both groups described providing and handling sputum as uncomfortable, difficult and stigmatising, it was still considered the gold standard for TB diagnosis because of its established reliability. HCPs believed that how a test was administered and by whom was more important than the specimen itself.
Conclusions: TB specimen preferences were shaped by multiple factors such as convenience, trust, dignity, and perceived reliability. Understanding what makes a test acceptable is important for health messaging to promote and improve uptake.

SOA08-583-20 Healthcare worker acceptance of tongue swabs for tuberculosis screening with migrants in Italy: A qualitative study

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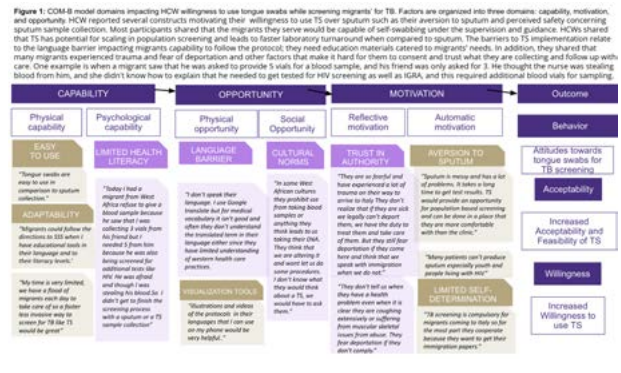
Background: HCWs who come into contact with TB patients are at elevated risk of TB infection and disease. The collection and handling of sputum samples pose exposure risks to HCWs. An alternative sample, tongue swabs (TS), was introduced in part to help mitigate some of these risks and challenges.
This study aims to evaluate HCWs' perceived risks, opportunities, and barriers to the use of TS for active TB screening among migrants.
Design/Methods: This study uses in-depth interviews to understand barriers and facilitators to TS use with people migrating to Italy from the Indian Subcontinent and Africa. Purposive sampling was used to enroll HCWs experienced in collecting both sputum and TS samples for TB screening. We adapted Hamilton's Rapid Qualitative Analysis Methods to summarize key findings. Recruitment of HCWs continues until theme saturation is reached.



Results: Emerging themes are shown in Figure 1. All HCWs expressed the need for early TB detection upon migrants' arrival. To support the scaling of TB screening, they indicated a preference for TS over sputum. HCWs shared their perspective that TS was safer to collect, easier to analyze, and provided a possibility of pooling samples. They shared that both symptomatic and asymptomatic migrants could self-swab effectively. They all emphasized the need for solutions to the language barrier and lack of

curated health promotion and educational materials for TB care for migrants. All HCWs reported the need for supervision during swabbing because migrants needed guidance to ensure they were scraping the biofilm off the dorsum of the tongue.

Conclusions: Relative to sputum, HCWs expressed the benefits of TS include the potential for a higher diagnostic yield and a safer tool for TB screening. They also shared the need for tailored educational resources to help mitigate barriers to TS implementation in migrant settings.

SOA08-584-20 Diagnostic accuracy of MultNAT and PortNAT with Swab Sample compared with Xpert MTB/RIF Ultra for *Mycobacterium tuberculosis* (MTB) detection in Nigeria

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Background: Accurate screening and diagnostic tests are urgently needed to improve tuberculosis (TB) case finding and advance early detection in high burden settings. This study evaluated the diagnostic accuracy of two new testing tools, MultNAT and PortNAT using swab sample, for detecting MTB, with Xpert MTB/RIF Ultra as the gold standard.

Design/Methods: From January to March 2025, 100 participants aged 12 years and older presenting with cough, or people living with HIV with an elevated C-Reactive protein (CRP) of more than 5mmg were enrolled and tested using MultNAT and PortNAT. Tongue swabs were collected, placed in a tube with its reagents, transported and processed according to manufacturer manual. Diagnostic accuracy of the new tools was assessed against sputum Xpert Ultra results.

Results: The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of MultNAT and PortNAT in relation to Xpert MTB/RIF Ultra shows significant differences in the performance of the two tests. MultNAT demonstrated a sensitivity of 82.1% and a specificity of 95.8% compared to Xpert, while PortNAT exhibited a sensitivity of 46.4% and a specificity of 95.8%. This indicates that MultNAT was more effective in correctly diagnosing MTB, resulting in fewer false negatives. However, PortNAT exhibited a higher PPV of 100% compared to MultNAT's 95.8%, suggesting that a positive result from PortNAT is more likely to be a true positive. This study provides valuable insights into the comparative performance of MultNAT and PortNAT in detecting MTB using swab.

		Nyanya (46)	Gwagwalada (54)	Overall (100)
Port-NAT	Sensitivity	46.7% (7/15)	46.2% (6/13)	46.4% (13/28)
	Specificity	97.4% (38/39)	93.9% (31/33)	95.8% (69/72)
	Positive Predictive Value	100.0% (7/7)	100.0% (6/6)	100.0% (13/13)
	Negative Predictive Value	84.4% (38/45)	86.1% (31/36)	85.2% (69/81)
Mult-NAT	Sensitivity	73.3% (11/15)	92.3% (12/13)	82.1% (23/28)
	Specificity	94.9% (37/39)	97.0% (32 /33)	95.8% (69/72)
	Positive Predictive Value	91.7% (11/12)	100.0% (12/12)	95.8% (23/24)
	Negative Predictive Value	92.5% (37/40)	97.0% (32/33)	94.5% (69/73)

Table 1. Diagnostic accuracy of MultNAT and PortNAT in relation to Xpert MTB/RIF Ultra across the two clinical sites in Nigeria.

Conclusions: In comparison to Xpert, MultNAT showed better sensitivity in identifying MTB cases, while both MultNAT and PortNAT had high specificity. Although PortNAT had a lower sensitivity, its 100% positive predictive value suggests that a positive result from this test is highly reliable.

SOA08-585-20 Sensitivity of PortNAT TB tongue swabs in adults with confirmed pulmonary TB: Results from a diagnostic study

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Background: Tuberculosis (TB) remains a major global health challenge, particularly in low- and middle-income countries, where access to rapid and accurate diagnostic tools is often limited. Point-of-care tests (POCTs) that are rapid, reliable, and affordable are essential for improving TB detection.

PortNAT TB is a novel, portable nucleic acid test designed to detect Mycobacterium tuberculosis DNA from tongue swabs, offering potential as a non-invasive diagnostic tool. However, its diagnostic accuracy must be assessed before clinical use.

Design/Methods: We conducted a prospective multicentre cross-sectional study enrolling 49 adults with bacteriologically confirmed pulmonary TB based on Xpert MTB/RIF Ultra from sputum. Each participant provided two tongue swab samples, tested using PortNAT TB and Xpert Ultra. The primary outcome was the sensitivity of the PortNAT TB tongue swab.

Results: Among 49 participants with confirmed TB, PortNAT TB detected TB in 22 (44.9%) compared to Xpert Ultra from sputum. Sensitivity was higher in smear-positive individuals (73.3%, 11/15) than in smear-negative individuals (32.4%, 11/34). Xpert Ultra from tongue swabs had a sensitivity of 46.9% (23/49) against Xpert Ultra from sputum. Compared to Xpert Ultra from tongue swabs, PortNAT TB had a sensitivity of 82.6% (95% CI: 61.2–95.0%), increasing to 91.7% (95% CI: 61.5–99.8%) in smear-positive participants and 72.7% (95% CI: 39.0–94.0%) in smear-negative participants.

Group	Total	PortNAT Tongue Swab (vs Xpert sputum)	Xpert Tongue Swab (vs Xpert sputum)	PortNAT Tongue Swab (vs Xpert Tongue swab)
All Participants	49	22 (44.9%)	23 (46.9%)	19 (82.6%)
Sputum smear Positive	15	11 (73.3%)	12 (80.0%)	11 (91.7%)
Sputum smear Negative	34	11 (32.4%)	11 (32.4%)	8 (72.7%)

Conclusions: PortNAT TB demonstrated moderate sensitivity (44.9%) for TB detection from tongue swabs, with higher sensitivity in sputum smear-positive individuals (73.3%) compared to those who were smear-negative (32.4%). While its sensitivity was slightly lower than Xpert Ultra from tongue swabs (46.9%), PortNAT TB showed high concordance with Xpert Ultra, particularly in smear-positive individuals. These findings suggest that PortNAT TB may have the potential as a complementary tool for TB diagnosis. Further studies are needed to assess its feasibility and utility in diverse populations and clinical settings.

SOA08-586-20 Evaluation of clinical performances of the PATHFAST TB LAM Ag assay, a new diagnostic test for tuberculosis

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Background: Tuberculosis (TB) remains a global health burden, with 10.8 million new cases and 1.25 million deaths in 2023 (WHO). Current diagnostic tools—microscopy, PCR, and culture—suffer from various limitations, including low sensitivity, long time-to-result, and high cost. The PATHFAST TB LAM Ag assay (PHC Corporation), a chemiluminescent immunoassay, quantifies lipoarabinomannan (LAM) in sputum within 1 hour and may offer a rapid alternative for TB diagnosis and monitoring.

Design/Methods: We retrospectively evaluated the performance of PATHFAST using 100 decontaminated and frozen sputum samples at the French National Center for Mycobacteria. Of these, 40 samples were positive for *M. tuberculosis* (20 smear+/culture+, 20 smear-/culture+), 20 were negative controls, and 40 were positive for non-tuberculous mycobacteria (NTM).

Additionally, longitudinal samples from 8 patients with pulmonary TB were tested to assess treatment monitoring.

Results: The PATHFAST assay showed an overall sensitivity of 75% and specificity of 55% for MTB detection, with cross-reactivity observed in 23/40 NTM-positive samples, consistent with prior studies. A strong correlation was observed between LAM concentration and time to culture positivity (Spearman r = 0.873).

Importantly, in the 8 follow-up patients, LAM levels significantly decreased after one month of treatment ($p = 0.002$), indicating potential for treatment monitoring.

Conclusions: In conclusion, the PATHFAST TB LAM Ag assay offers a rapid, easy to handle approach for detecting MTB in sputum. While low specificity was attributed to NTM cross-reactivity, this could be a potential for diagnosing NTM infections.

The results in monitoring early treatment response are very promising since no tests are provided today in this indication. Further studies with more longitudinal data are warranted to confirm these findings.

SOA08-587-20 Lipoarabinomannan (LAM) as a biomarker for the diagnosis of tuberculosis

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Background: Routine diagnostic methods for tuberculosis (TB) rely on detecting pathogen-specific DNA or bacterial growth in culture. Lipoarabinomannan (LAM), a component of the mycobacterial cell wall, has emerged as a promising biomarker for TB diagnosis.
Currently, only LAM detection in urine is endorsed as diagnostic point-of-care test by the WHO for TB, restricted to people living with HIV.
This study aims to independently evaluate the PATHFAST LAM Ag assay for pulmonary TB diagnosis, assess its reproducibility and optimize sputum-based testing, and explore its utility in non-sputum matrices (serum, plasma, urine, and exhaled breath).
Design/Methods: The PATHFAST TB LAM Ag Test is an in-vitro diagnostic test that quantitatively measures LAM concentration in sputum. Based on chemiluminescence enzyme immunoassay in just 17 minutes. PATHFAST LAM Ag assay was evaluated for diagnostic accuracy on sputum specimens from confirmed culture patients and healthy controls recruited at the Research Center Borstel in Germany.
Moreover, assay reproducibility was evaluated in sputum samples.
Additionally, diagnostic accuracy was also evaluated on serum, plasma, urine and on collectors of exhaled breath.
Results: With the manufacturer's declared cut-off, the assay was 85.2 % sensitive and 100 % specific on sputum samples. Reproducibility analysis of duplicate sputum samples had a mean coefficient of variation (CV) of 54.5 % (SD = 31.8) for non-homogenised samples which could be reduced to CV of 16.0 % (SD = 27.3) by homogenisation with 2.5 % NALC-NaOH solution.
The assay's diagnostic accuracy of PATHFAST LAM applied to non-sputum matrices was insufficient (results not shown).
Conclusions: The PATHFAST LAM Ag assay is meeting the WHOs TTP benchmark for a near point-of-care-test for the diagnosis of TB on sputum samples. Reproducibility is greatly enhanced by homogenising sputum samples prior to analysis. For non-sputum biological matrices, like urine, serum, plasma or exhaled breath the assay is not suitable for TB diagnosis.

SOA08-588-20 Performance of Fujifilm SILVAMP TB LAM for detection of pulmonary tuberculosis across different healthcare facilities and urban-slum communities in Bangladesh

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Background: The Fujifilm SILVAMP TB LAM (FujiLAM) assay, a urine-based point-of-care test, has shown promise for detecting pulmonary tuberculosis (PTB) in HIV-positive patients. However, its performance in HIV-negative populations remains unclear.
This study evaluates the performance of FujiLAM for PTB detection among adults in Bangladesh, across primary and district healthcare facilities and urban-slum communities.
Design/Methods: As part of the 'Start4All' project, urine samples were collected from presumptive PTB patients (aged ≥15 years) between July 2024 and February 2025. Participants were enrolled through passive case finding at healthcare facilities and active case finding in urban slums. Sputum samples were tested using Xpert MTB/RIF Ultra (Ultra) and cultured on MGIT 960. FujiLAM results were compared to sputum Ultra and culture to assess sensitivity and specificity.
Results: A total of 2165 participants with available sputum culture results were included. The overall FujiLAM positivity rate was 3.3% (71/2165), highest in urban slum (5.8%, 45/781), followed by district (2.6%, 16/622) and

primary (1.3%, 10/762) healthcare facilities. Against the microbiological reference standard (sputum Ultra and/or culture), FujiLAM showed an overall sensitivity and specificity of 28.5% (49/172) and 98.9% (1971/1993), respectively. At the district level, sensitivity and specificity were 37.2% (16/43) and 100% (579/579), respectively. At the primary level, they were 20.5% (9/44) and 99.9% (717/718), respectively. In urban slum populations, FujiLAM demonstrated 28.2% (24/85) sensitivity and 97.0% (675/696) specificity.

Conclusions: FujiLAM demonstrated high specificity but suboptimal and variable sensitivity across settings in adults in Bangladesh. These findings underscore the need for further refinement of the assay to improve its utility as a non-sputum-based diagnostic tool for detection of PTB in HIV-negative populations at low-resource contexts.

SOA08-589-20 Diagnostic accuracy and reproducibility of the FujiLAM II point-of-care assay to detect TB in stored urine specimens

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Background: Currently the only WHO-recommended urine-based, point-of-care test to detect TB is the AlereLAM, with limited sensitivity. Earlier versions of the FujiLAM test showed lot-to-lot variability. The new FujiLAM II assay (Fujifilm, Japan) has been designed to address these limitations, and clinical and analytical evaluations are needed.

Design/Methods: We tested bio-banked urine specimens collected from people living with HIV in two prospective cohort studies. Urine samples were tested on the FujiLAM II and read by two readers blinded to other results. Sensitivity and specificity were assessed against a microbiological reference standard including two sputum cultures, sputum Ultra, blood Ultra, and other results, with AlereLAM as comparator. Sensitivity was evaluated across four lots with graded intensity levels. In addition, the limit of detection (LoD) and lot-to-lot reproducibility were assessed across 10 lots using cultured LAM and 87 clinical specimens with quantified LAM concentrations (EclLAM, MesoScale Diagnostics, USA).

Results: Urine from 810 people was tested, including 119(15%) with bacteriologically-confirmed TB and complete results. Preliminary estimated sensitivity of FujiLAM II was 50% (59/119, 95%CI:40-59) and specificity was 96% (638/667, 95%CI:94-97). Sensitivity in hospitalized participants (median CD4 count 77 cells/mm3, IQR: 51-186 cells/mm3) was 55% (37/67, CI:42-67) as compared to 42% (22/52, 95%CI:29-57) in ambulatory participants. In comparison, AlereLAM sensitivity was 36% (43/119, 95% CI:28-46, difference +14%). Sensitivity was similar across three additional lots (49% (58/119), 52% (62/119), 49%(58/119)). Further analyses confirmed reproducible results across 10 additional lots in contrived and clinical specimens.

Conclusions: Sensitivity of the FujiLAM II assay was 50%, as compared to 36% for AlereLAM, in people living with HIV in this study, which is lower than WHO target product profile of 65% for non-sputum point-of-care tests. The assay had reproducible results across multiple lots in both analytical and clinical testing.

SOA08-590-20 Effect of sputum quality on performance of tuberculosis molecular bacterial load assay for tuberculosis diagnosis and treatment monitoring among adults in Uganda

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Background: WHO has identified Tuberculosis Molecular Bacterial Load Assay (TB-MBLA) as a potential replacement for sputum smear microscopy to monitor TB treatment due to its high accuracy. This study evaluated the effect of sputum quality on performance of TB-MBLA.

Design/Methods: Tuberculosis presumptive adult patients were prospectively enrolled for a longitudinal follow up study at Naguru Hospital Kampala, Uganda. Participant sputum was collected at enrolment, its macroscopic quality was documented and tested using Xpert MTB/RIF Ultra and TB-MBLA. All Xpert MTB/RIF Ultra positive

patients at enrolment received 6 months of anti TB treatment and their sputum quality documented and tested at 2, 8, 17, and 26 weeks post-treatment initiation. Using Mycobacteria Growth Indicator Tube (MGIT) culture as a reference test, we compared difference in diagnostic yield, sensitivity and specificity of TB-MBLA among sputum quality categories using 2 sample tests of proportions.

Results: We included 637 (198 at diagnosis) samples in our analysis. The majority of samples were salivary (349, 55%), while blood-stained (16,3%) were the least common. Compared to a combined positive TBMBLA proportion for other sample types, salivary samples had the lowest (-0.4; 95% CI -0.44, -0.30) while purulent had the highest (+0.5; 95% CI 0.30- 0.44) proportions. Overall, salivary samples had a lower sensitivity by 19% (95% CI 13-25), 27% (95% CI 20-34), and 30% (95% CI 25-35) compared to mucoid, purulent, and blood-stained samples, respectively. Sensitivity didn't vary significantly by sputum types at diagnosis. At follow up only, salivary samples still showed significantly lower sensitivity by 22% and 33% when compared to Mucoid and purulent samples respectively. Specificity for mucoid and purulent samples was lower than salivary samples by 8% and 37% respectively (Table1).

	per sample type at follow-up only			
Sample type (n)*	Sensitivity(95%CI)[1]	Comparison of sample types	diff[2] (95% CI)	P value
Salivary (n=289)	58.5% (42.1- 73.7)	Mucoid - Salivary	22% (13-30)	0.0001
mucoid (n=132)	80.4% (66.9-90.2)	Purulent - Salivary	33% (19-48)	0.003
Purulent (n=17)	91.7% (61.5- 99.8)	Purulent - Mucoid	8% (-7- 22)	0.2
Sample type	Specificity(95%CI)	Comparison of sample types	diff (95% CI)	P value
Salivary (n=289)	96.8% (93.7- 98.6)	Salivary - Mucoid	8% (2.2-13)	0.0006
mucoid (n=132)	88.9% (80-94.8)	Salivary - Purulent	37% (13-60)	0.0001
Purulent (n=17)	60% (14.7-94.7)	Mucoid - Purulent	29% (50-53)	0,0007
(n)*=total samples analysed per sample type	(95%CI)[1]=95% Confidence intervals		diff[2]=Difference of sensitivity or specificity between sample types	

Table1: Performance of TBMBLA

Conclusions: Quality of sputum samples should be emphasized when using TB-MBLA for treatment monitoring. Studies with bigger sample sizes are required to confirm our findings.

SOA08-592-20 Xpert MTB/XDR external quality assurance rollout by NTP Bangladesh: A milestone unveiled

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Background: The National Tuberculosis Control Program (NTP) of Bangladesh has introduced the Xpert MTB/XDR assay as a reflex test primarily focusing to diagnose resistance to Isoniazid and Fluoroquinolones. This implementation allowed expanded access to Drug Susceptibility Testing (DST) and ensured early treatment with appropriate regimen. External Quality Assessment (EQA) Proficiency Testing (PT) is essential to maintain quality across pre-analytical, analytical, and post-analytical stages of the assay. In 2024, NTP Bangladesh launched EQA PT program for Xpert MTB/XDR assay, in collaboration with the ICMR - National Institute for Research in Tuberculosis (NIRT), Chennai with technical support from FIND.

Design/Methods: Dried Tube Specimen (DTS) panels were manufactured at NIRT Chennai using CDC's DTS technology and dispatched to NTP Bangladesh. EQA portal was adapted for data collection, monitoring and analysis. Reference lab staffs were oriented to monitor and implement EQA PT round. Panels were further shipped to Regional Reference Labs. They oriented site staffs regarding EQA protocol, data submission and handed over panels (5 panels/sites, set of 5 tubes/panel) for testing. Sites submitted their results through EQA portal. Scoring criteria were predefined by NIRT. Data was analyzed, shared with NTP and reports released to sites. Post EQA desk reviews were conducted for unsatisfactory and false reporting sites by reference labs, followed by repeat panel testing.

Results: A total of 81 sites participated, reflecting full national engagement. While 80 sites (98.8%) had satisfactory results (scored 80 or above out of 100), 1 site (1.2%) scored below 80. False resistance not detected results were reported by two sites. Post EQA assessments and corrective actions were carried out for both sites and on repeat PT both achieved 100 score.

EQA PT ROUND RESULTS	
No. of sites enrolled and participated (each having one machine)	**81**
Analysis of Results (through EQA portal)	
Sites with satisfactory results i.e. score of 80 & above (No. and %)	**80 (98.8%)**
Sites with unsatisfactory results i.e. <80 score (No. and %)	**1 (1.2%)**
➢ One site reported unsatisfactory results, i.e. False Resistance Not Detected to FLQ and Error-5007. ➢ Out of 80 machines with satisfactory results, 67 (83.75%) machines scored 100 and 13 (16.25%) machines scored 80-90. Among these 13 sites, 1 site (7.7%) reported False Resistance Not Detected, 11 sites (84.6%) reported errors (maximum 5007) and 1 site (7.7%) gave invalid result.	
Turn Around Time (TAT: Time between panel receipt and result submission)	
2 Days (No. and %)	**62 (76.5%)**
3-4 Days (No. and %)	**18 (22.2%)**
5-7 Days (No. and %)	**1 (1.3%)**

Conclusions: The implementation and operational performance of Xpert MTB/XDR EQA indicates quality testing capacity across the lab network with reliable diagnostic services.

SOA08-593-20 Incorporating differential test attributes into population-level models of new TB diagnostics

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Background: Mathematical models of tuberculosis (TB) provide valuable estimates of the population-level health impact of novel diagnostic tests. Test accuracy—sensitivity and specificity—as well as turn-around time (time to actionable test result, TAT), sample accessibility (ease of sample collection), and deployability (feasibility of test implementation across different settings) are important test attributes. We aimed to assess how these five key attributes are included in population-level transmission-dynamic modelling studies of TB diagnostic tests.
Design/Methods: We performed a scoping review of population-level transmission-dynamic modelling studies published between 2010 and 2023 that evaluated the impact of TB diagnostic tests. Publications were eligible for inclusion if current or novel TB diagnostic tests were modelled and at least one of either TB incidence, prevalence or mortality was considered as the outcome. We extracted data on the test investigated, inclusion of key test attributes (sensitivity, specificity, TAT, sample accessibility, and deployability), and how these attributes and their effects were modelled.
Results: We included 21 modelling studies. Nine (43%) investigated hypothetical future tests, nine (43%) modelled the implementation of Xpert MTB/RIF or Xpert Ultra, and three (14%) considered other tests. Population-level outcomes modelled were: TB incidence (16 studies, 76%), mortality (15 studies, 71%), and prevalence (11 studies, 52%). Of the 21 studies, 20 (95%) considered test sensitivity, eight (38%) considered TAT, seven (33%) considered specificity, eight (38%) considered deployability, and two (9.5%) considered sample accessibility.
Conclusions: Population-level models of novel TB diagnostics have primarily focused on improved sensitivity, with limited inclusion of other important test attributes. Current research and development is focused on non-sputum-based, easily deployable diagnostic tests with shorter TAT which current model formulations may not capture well. Future population-level models of TB diagnostics should incorporate a broader set of the key attributes to better estimate real-world impact in high-burden settings.

SOA09 Communities at the centre: Driving TB awareness, support, and science

SOA09-594-20 "Make sure you involve us": Experiences and care needs among youth with TB in East Africa

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Background: Tuberculosis (TB) is the leading infectious cause of death for youth (ages 15-24) globally. Data are needed on TB care needs among youth to inform youth-focused interventions.

Design/Methods: The TB Sentinel Research Network of the International epidemiology Databases to Evaluate AIDS is a global prospective study of people aged ≥15 with pulmonary TB. At sites in Eldoret, Kenya, and Mbarara, Uganda, in-depth interviews were conducted with a purposive sample of youth treated for TB and with healthcare workers (HCWs) providing TB care, following a semi-structured guide investigating youth experiences and care needs. A reflexive thematic analysis was conducted. A youth advisory board supported study implementation.

Results: We analyzed 28 interviews, with HCWs (n=15) and with youth with TB (n=13), among whom median age was 23, 7 (54%) were male, and one was living with HIV. Youth and HCW narratives described delays in youth TB diagnoses, with youth having multiple contacts with the healthcare system before accessing chest X-ray or TB testing (Table). Barriers to youth TB treatment adherence included pill burden and side effects, increased hunger coupled with food insecurity, and difficulties taking treatment at school. Stigma and depression particularly impacted youth, complicating TB diagnosis, contact tracing, and adherence. While some youth experienced persistent symptoms after treatment completion, they had limited access to care. Youth and HCWs expressed needs for increased TB awareness and access to testing, nutritional and economic support, stigma and mental health interventions, and post-TB care. They favored youth-friendly interventions, noting youth survivors may best promote TB awareness and treatment adherence, including through peer support and community-based interventions.

Select Themes	Illustrative Excerpts
Delayed TB diagnosis	"It took about 5 months [to be diagnosed with TB] while taking tablets for cough, not knowing what was in my chest. I would get them from [the] health center. … I was in pain; I was getting worse day by day. When I inquired about X-ray, I was told I could only find it in Mbarara. That is how I came for further medical tests, but I did not know that I had acquired TB. I had only come for check-up and to find out why the chest was paining me so much. When I arrived, I was tested, and it was discovered that TB and it's in advanced stages."
Experiencing TB symptoms at boarding school	"The cough started when I went to school. … I just went to the chemist and asked for a flu tablet which I was given, yes, I took it but then there was no change. So, when I saw no change, I decided to just forget about it because I could not come saying that I bought this and that, I took some time just assuming it, you are there, you go to class, you do whatever."
Financial difficulties	"During the time that I was admitted, for us at our home, family, we only depend on my dad, so that is why I decided that I look for something to do so that I can at least help him because … he is the only one helping everybody. … So that time when I was sick, we did not manage to pay the whole [hospital] bill, though at work they helped me a bit with ten thousand shilling then we paid half of it and there is still a pending bill. That is the problem that I have."
Experiences of stigma	"Even myself I was scared of my neighbors, because the moment they will know [about the TB diagnosis] everyone would close their door, so you will just be like neglected, people are looking at it like as if it is something like an abomination to them, as in they just look at you like as though you are cursed, they don't want to associate with you anymore. That is where you get yourself like...you just feel like these people don't want you anymore."
Post-TB: physical complaints	"After completing treatment, whenever I get flu or cough, they take long to recover, and I don't know why. Even sometimes I get weak. … Flu and cough have disturbed me a lot. Sometimes I get scared and think that I may have acquired TB again because I am not recovering from flu and cough."
Post-TB: difficulties accessing care	"I have had challenges because I got this problem two months ago but because I am at work they can't easily let me leave to come this side. By the time I get the permission it really takes time and even when I come this side and get the treatment, they write for me drugs that am supposed to buy yet I don't have money."
Post-TB: recovering after TB and overcoming stigma	"You know once you have completed your medication is when now your health is returning, but you need to remember that you have been down in those previous years, so maybe you lost your work, or lost something else, a lot of, maybe let's say, the things you had planned in life, you have lost them. Maybe you have lost friends. So, catching up to get all that back is not easy. … For someone who has lost things, they need support. … You know love is one of the supports, you need that love [from friends], so that you come and fit as a normal human being. So that people see you as normal and now you have fit into a similar league as them."
Needs for post-TB follow-up	"Like for my case … I still have some problems so they should at least inquire how the patient is doing even post-treatment because people respond differently."
Youth as "ambassadors" for increasing TB awareness and reducing stigma	"I usually tell people, 'Now I am an ambassador of TB' in some way. So, like TB is something that can be treated. Me, I took my medication and now, like, I'm good. So, I do tell people, like… if you do cough, you need to go take that test, it doesn't cost anything. … Telling that person to take the test you are trying to...you are just trying to make this TB look normal."

Conclusions: Youth experiences of delayed TB diagnosis, stigmatization, adherence barriers, and food insecurity have implications for TB transmission, treatment outcomes, and post-TB health. Multiple opportunities exist to improve youth TB outcomes. Interventions leveraging youth-led supports and meaningful youth involvement are needed.

SOA09-595-20 From research conceptualisation to scientific publication: A community actor's journey with TB research

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Background and challenges to implementation: Civil society (CS) and communities' engagement, as emphasized in the multisectoral accountability framework for TB (MAF-TB), demands creating opportunities for their meaningful capacitation and leadership in TB research. While they are increasingly engaged in scientific advisory boards to help set the research agenda, inform study design and implementation, their inclusion–much less leadership–within scientific publication endeavors remains poor. Unfamiliarity with theoretical foundations of research, academic writing, journal submission processes, coupled with competing responsibilities in the community, low investment in research capacitation, hinder their contribution to TB scientific discourse.
Intervention or response: We describe key components of successful scientific publication of community-led TB research, using a recent publication on MAF-TB as an example. We delineate publication process stages, including rigorous representation of quantitative and qualitative data, adherence to publication standards, journal selection, peer review navigation, article processing. We showcase how the process was orchestrated by community and CS, ensuring the inclusion of diverse perspectives–TB survivors, government representatives, researchers (clinical and social science), technical agencies, and funders. By integrating these elements, we showcase how a well-coordinated and collaborative approach can enhance the visibility and impact of community-driven research within the scientific community.
Results/Impact: In the result of this collaborative process, a peer-reviewed manuscript led by CS was successfully published. This presentation demonstrates that with appropriate support, CS can effectively navigate academic publishing and contribute rigorous, policy-relevant evidence grounded in lived experience.
Conclusions: Raising visibility and credibility of community-led research is vital for integrating the experiences of those most affected by TB into policy and practice. Peer-reviewed publications are essential to facilitating this process and establishing community-derived knowledge as scientific evidence. We underscore the significance of increasing multi-stakeholder collaboration in TB research as imperative for decolonizing knowledge, scaling impact, and influencing policy.

SOA09-596-20 Aida on WhatsApp: AI-powered support for TB treatment

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Background and challenges to implementation: Tuberculosis (TB) remains the deadliest infectious disease, claiming over 4,000 lives daily. Despite being curable, treatment requires daily medication for at least six months, and many patients face barriers to adherence.
While Directly Observed Treatment (DOT) is the standard, it is resource-intensive and not always person-centered. Digital Adherence Technologies (DATs), such as smart pillboxes, showed high engagement in the ASCENT project (2019–2023), but the overall impact on treatment outcomes was limited. This recognizes the need for exploring additional digital interventions to support people on TB treatment.
Intervention or response: To address this, KNCV TB Plus developed ***Aida***, a virtual TB treatment supporter powered by OpenAI's GPT-4o and delivered via WhatsApp. Aida offers multilingual, interactive support, providing 24/7 access to personalized treatment information, motivational messages, and answers to common questions. It complements—not replaces—healthcare provider support and was built using insights from individuals and providers engaged in DAT-supported care.

Results/Impact: In November 2024, **Aida** was pilot tested with 70 public health professionals from 26 countries during the Union World Conference on Lung Health. Most participants came from Indonesia, South Africa, Bangladesh, Nigeria, Uganda, and India. Users exchanged over 500 messages with Aida. Common topics included treatment duration, medication details, side effects, symptom management, and emotional support. Feedback from this test helped refine Aida's content, language, and usability, informing the design of a larger feasibility study.

Conclusions: Aida shows early promise as a digital tool to support TB treatment. A field study is currently underway to evaluate its feasibility and acceptability in real-world healthcare settings.
Findings will help determine how AI-powered chat services can be integrated into TB care programs globally to improve support and adherence.

SOA09-597-20 Community radio stations: A powerful, real and relatable, ‚last mile' communications platform, going beyond, resulting in early TB screening and testing

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Background and challenges to implementation: Community-level demand generation for TB sevices has been identified by India TB Programme as a key pillar for ending TB. This calls for a mass behaviour change drive towards adoption of health-seeking behaviour. But there are still many remote geographies; typically, areas that might host significant populations vulnerable to TB.
Community Radio Stations (CRS), play a pivotal role in reaching these remote, underserved communities to disseminate information on important issues. Can they convert this into a demonstrated impact on programme metrics?
Intervention or response: The Union, supported by the Gates Foundation, implemented a community awareness, engagement and empowerment intervention through the hyper-local medium of community radio stations (CRS). The objective was to understand the role that these CRS could play, beyond standard communications programming, in nudging participation in Active Case Finding (ACF) drives leading to early screening and testing. It was rolled out through SMART NGO, in 27 high TB burden districts (> 316/1,00,000) with a potential broadcast population of 6.3 million.
Results/Impact: Through, broadcast programming and narrowcasts (in-person engagement), the radio jockeys evolved beyond communicators to community influencers.
They energised a 'whole-of-society' movement by engaging multiple stakeholders in this mission, convinced TB survivors to shed inhibitions and share their stories of hope to address stigma, engaged with local officers to complete the loop and raised TB decibel levels on social media and press.
7,468 community members reached in-person, 892 calls received through dial-in for more information, 215 TB survivors engaged leading to 135,436
people screened during ACF. A dipstick survey showed 50%+ decrease is misinformation and almost a 100% increase in awareness about government schemes.
Conclusions: Community Radio Stations, being community owned, can play a transformative role towards ending TB by giving voice to TB community, social acceptance of TB health-seeking behaviour & providing linkages with services being offered, leading to early disgnosis.

SOA09-598-20 Enhancing TB treatment adherence: Evaluation of a digital support tool in Argentina

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Background and challenges to implementation: Digital Adherence Technologies (DATs) are recommended to address TB treatment non-adherence. Our team developed the Tuberculosis Treatment Support Tools (TB-TST) intervention for testing in Argentina, where treatment success rates are low. This study presents findings from exit surveys conducted with individuals with TB randomized to the intervention.
Intervention or response: The application offers TB education, adherence tracking by self-report and a urine metabolite test, side effects monitoring, an anonymous patient forum, and communication with treatment supporters (TSs).
The study was conducted at four public hospitals where patients undergo self-administered treatment. Four hundred participants with confirmed TB were randomized into usual care or TB-TST intervention. Exit surveys assessed user experience, satisfaction, motivation, and recommendations.
Data were analyzed with descriptive statistics and thematic analysis. The study was approved by relevant ethics committees and participants provided written informed consent.
Results/Impact: Eighty participants completed the survey. The application was rated "very easy to use" (4.3/5±0.8) and the metabolite test was considered "easy to use" (3.9/5±1.0). Participants highly recommended the application (4.7/5±0.6), describing it as helpful, efficient, and practical.
The most valued features were medication reminders, access to a TS enabling quick medical assistance and support, while patients initiating treatment found the forum helpful in managing expectations.
Challenges included lack of calendar notifications of appointments, technical issues with uploading reports and test result images, and alarm issues. Key adherence motivators included improving health, preventing disease

transmission, and family support, with encouragement from TSs and other peers reinforcing adherence. Most participants found the metabolite test helpful in reducing hospital visits. Some improvements included adding alarms, appointment alerts, direct communication with doctors, nutritional information, and visual aids showing lung improvement.

Theme	Quotation
Positive experience	"The app was a companion in the early days when I felt so sad and lost because of the disease. Knowing that there were professionals who answered my questions and there were other patients like me made me feel better. I'm not exaggerating. Reading experiences or having patients tell me that everything was going to OK made me feel better. I didn't feel so alone."
Challenges	„I used the app for medication and appointment reminders but prefer my phone's system. On the phone, I can set multiple alarms for different medication times, while the app needs daily individual entries. For appointments, the phone allows alerts a day before or widgets for easy access, which I found more useful for organization."
Motivation	"I wanted to recover my health and physical condition - because I had lost much weight - and return to my daily routine. I was also worried about infecting someone else. It helped me enormously to receive support from my family, who always accompanied me to all my check-ups."
Metabolite test	"The app is very good, and I´m sorry for the delay in sending the images of the test strips as I don't have money, and there were times when I didn't have internet access. It's practical, so you don't always have to go to the hospital for testing."
	The application should ask how the patients are doing from time to time. Sometimes, you feel fear, and feeling accompanied makes you feel better."
Recommendations	"I had a good experience in the use of the test; if I have to give a recommendation, it would be to include the cup with the strips; in my case, we do not consume products in which we can use the container, and we can´t afford to buy sterile containers so often.

Conclusions: This study demonstrates the potential to support treatment adherence by addressing practical and emotional needs. Findings provide insights for refining DATs in TB treatment programs.

SOA09-599-20 Engaging religious leaders to drive active TB case finding at the community level: Implementation outcomes from Enugu State, Nigeria

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Background and challenges to implementation: Nigeria has a high TB burden, with significant gaps in community-level case detection. In Enugu State, religious institutions are highly influential but had been underutilized in active TB case finding. Barriers such as limited engagement, stigma, and low TB literacy among faith leaders hindered progress. In 2024, a structured approach was implemented to engage religious leaders in promoting TB awareness and screening. This abstract presents key outcomes and lessons from this community-centered strategy.

Intervention or response: Under the Global Fund TB project, a stakeholder engagement framework was implemented to target religious leaders in active TB case finding efforts across Enugu State, Nigeria.

The approach included mapping religious institutions to nearby DOTS facilities to strengthen referral linkages, conducting advocacy visits to introduce the outreach team, and documenting worship schedules to guide targeted outreach.

TB education messages were integrated into routine religious activities, and the outreach team coordinated sputum sample collection, transportation of samples to diagnostic facilities and linkage to care. Data from January to December 2024 were analyzed using Microsoft Excel.

Results/Impact: A total of 32,000 individuals were screened at religious worship centers, leading to 6,124 presumptive TB cases and 748 confirmed cases successfully linked to treatment at DOTS centers. The intervention contributed 19% of the state's TB cases and supported a 27% increase in case finding compared to 2023. Religious leaders improved community acceptance, eased treatment uptake, and helped demystify TB, reducing the need for follow-up. Below is the intervention's contribution to state TB case finding.

Conclusions: This intervention underscores the effectiveness of partnering with religious leaders to enhance TB case finding in community settings.
The Enugu experience offers a replicable, culturally appropriate model for other high-burden areas aiming to reduce TB diagnostic gaps through faith-based collaboration.

SOA09-600-20 Improving knowledge and access to health and development information for illiterate women and girls in three urban slums in Southeast Nigeria

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Background: The COVID-19 pandemic revealed the vital need for accessible health information, especially for marginalized populations. Illiterate women and girls in urban slums are faced with significant barriers to accessing vital health messages, as these were often shared through print media, limiting their reach.
This project was conceived during the pandemic to bridge this knowledge gap and improve access to health information by utilizing localized audio formats, providing a more inclusive solution for those most vulnerable.
This project aimed to increase access to essential health information for illiterate women and girls, using audio formats tailored to local contexts.
Design/Methods: A quasi-experimental study design was adopted. The study involved three arms: A control and two intervention arms. Localized health messages (Covid-19, Tuberculosis, Pneumonia as well as other health topics) in audio forms were administered to illiterate and semi illiterate women and girls in intervention groups via WhatsApp platform (Group-1) and memory card (Group-2) from July to September 2021.
Pre and Post test was conducted to ascertain increase in knowledge. Good knowledge of life events was determined by proportion of respondents who correctly answered ≥50% of 34 variables.
Results: A total of 503 illiterate women and girls were enrolled for this intervention across all groups (WhatsApp group- 202, Memory card group-201, Control group-100).
At baseline, the control group had the highest proportion of respondents with good knowledge (69.0%) (WhatsApp group = 47.0% and memory card, 63.2%) ($p<0.001$). At post intervention, the WhatsApp group had the highest increase in proportion of respondents that had good knowledge (51%) followed by the memory card group (36.8%) then the control group (17.2%). ($p<0.001$).
Conclusions: The use of WhatsApp and memory card to disseminate localized audio health messages are effective and should be encouraged especially among the illiterate and semi-illiterate population.

SOA09-601-20 Enhancing the detection of people with TB (PwTB) in Mozambique

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Background and challenges to implementation: Mozambique is one of the high TB, DRTB, and TB/HIV burden countries of the world. Low detection of PwTB with persisting gap between the estimated incident cases and notified cases remained a critical challenge in the country. The gap was higher in cases of DRTB. The country was additionally challenged by suboptimal proportion in the notified bacteriologically confirmed TB.
The key underlying reasons of inadequate TB detection were difficult geographic terrains and scattered population especially in the Northern provinces of Mozambique with poor outreach activities, limited laboratory facilities across the country, difficulties in sample collection and transportation from the peripheral health-facilities, continuing dependence on diagnosis by sputum microscopy, and low coverage of key and vulnerable (KVP) population.
Intervention or response: The National TB Control Program (NTP) of Mozambique adopted following strategies to enhance the detection of PwTB, facilitated by the updated NSP

1. Rapid scaling up of confirmatory tests by CBNAAT and Truenat
2. Well-planned sputum collection and transportation from non-lab health-facilities to lab-facilities in the districts and provinces
3. Active case finding in selected KVP like miners, ex-miner, prisoners, health-workers, and PLHIV
4. Organization of mobile health services in difficult-to-reach areas

5. Engagement of activists, community-radios, and CSO-partners in fast-tracking community awareness, de-stigmatization, gender-equity, and community-led monitoring activities
6. Comprehensive capacity building of health and community-staff

Results/Impact: Between 2019 – 2024, Mozambique showed a steady incline in the notification of all types of TB, and reduced the gap between estimated incident cases and notified cases. There was a rapid rise in proportion of bacteriologically confirmed TB, and increase in notification of RR/MDR TB, due to increase in primary testing by NAAT. Community-level interventions, and better coverage of the underserved areas further improved case notification in Mozambique.

Indicators	2019	2020	2021	2022	2023	2024
# presumptive cases tested primarily by NAAT	137927	167924	243280	307563	656048	413164
# PwTB notified (all types)	97111	97093	98485	110674	116817	107325
# Drug-sensitive PwTB notified	95645	95677	97010	109110	115035	105468
# Drug-resistant PwTB notified	1466	1416	1475	1564	1782	1857
# Bacteriologically confirmed PwTB notified	29419	32159	36205	45948	53505	52400
# Paediatric PwTB notified	12853	11850	11531	13664	13101	12078
# TB-HIV co-infected notified	31897	26354	24313	27916	26919	25072

Conclusions: The NTP of Mozambique documented good lessons to improve TB notification in the low resource-settings, based on strategic planning, enhanced capacities, and optimal resource-utilization.

SOA09-602-20 Finding the forgotten: Community-led TB surveillance in fragile, conflict-affected communities in Borno and Adamawa States of Northern Nigeria

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Background and challenges to implementation: Insecurity, displacement, and deep-rooted stigma have rendered large swathes of Northern Nigeria "invisible" to routine TB surveillance. These neglected geographies, characterized by armed conflict, gender-based restrictions, and fractured health systems, harbor undetected chains of TB transmission, threatening national disease control gains. To address this, the Global Fund-supported N-THRIP project mobilized community-based organizations (CBOs) to lead a locally rooted, trust-based approach to TB case finding in some of the most fragile and security-challenged areas of Borno and Adamawa states.

Intervention or response: Between January and December 2024, CBOs were empowered to co-design and implement TB screening in eight conflict-affected Local Government Areas (LGAs), many of which are inaccessible to formal health actors. With the support of trained community health volunteers (CHVs), survivors of TB, and locally respected influencers, door-to-door outreach was conducted, integrating TB education, symptom screening, sputum collection, and referral.

Gender-sensitive strategies included deploying female-only teams in conservative communities, while stakeholder dialogues with religious and traditional leaders, built trust and safe entry points. Data were aggregated and analyzed to determine screening reach, presumptive identification, bacteriological yield, and linkage to treatment.

Results/Impact: Out of 256,128 individuals screened across both states, 48,857 (19%) were reached in the high security challenged LGAs. These areas demonstrated a presumptive-to-case ratio of 9:1, outperforming the national average of 10:1, and a 10% TB yield. Crucially, all confirmed cases were notified and linked to treatment, achieving a 100% notification rate.

Conclusions: In fragile, underserved regions where traditional TB programs falter, community-led programming offers a resilient and inclusive pathway to finding the missing cases. By leveraging local actors, cultural fluency, and trust-building mechanisms, this approach illuminates hidden epidemics and reestablishes the community's trust in health systems. Scaling such community-first models can catalyze a paradigm shift in TB control across humanitarian and post-conflict settings.

SOA09-603-20 Strengthening accountability in service delivery and commodity availability through community-led monitoring: A collaborative approach in Kenya

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Background and challenges to implementation: Some of the challenges in service delivery and commodities in African countries stem from weak healthcare systems, poor leadership, limited access, inefficiencies in procurement and supply chains that lead to frequent shortages of essential health commodities. Amref with the support of Global Fund and in collaboration with stakeholders implemented this intervention to ensure that there is accountability for health commodities at health facilities.

Intervention or response: The project was implemented from July 2023 to Dec 2024 where the project started with training of peer monitors on CLM and the use of Imonitor ATM+ tool across 25 counties. Communities gave their feedback through the Imonitor tool across all thematic areas and a team of duty bearers called Superusers responded to the issues being raised periodically. Also, issues were discussed in various forums allowing feedback and advocacy.
Results/Impact: In 2023 a total of 21,943 commodity and service delivery issues were raised in iMonitor representing 69% of the total issues raised. Commodity issues were 11,710 53% while Service delivery 10,233 47% . 3221 issues were resolved. Some of the feedback shared under commodities were there were no TB drugs, no condoms and no lab reagents. Under service delivery the feedback was on Social Health Authority SHA/NHIF not functioning and long waiting time for patients in health facilities. [CM1] In Busia there were shortages of drugs and due to the advocacy of the citizen advocates the deputy governor fast tracked the distribution of drugs in the health facilities.
[CM1]Period covered in intervention should suffice.
Conclusions: CLM is a powerful accountability mechanism that amplifies community voices, strengthens transparency and drives meaningful improvements in service delivery at the facility level. These successes can also be attributed to the power of collaboration across governments, civil society and communities.

SOA09-604-20 Beyond the pack: Integrating behavioural science to strengthen pictorial health warnings in India

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Background and challenges to implementation: Pictorial health warnings (PHWs) on tobacco product packaging are a globally recognized, evidence-based strategy to reduce tobacco consumption and deter initiation, particularly among youth and first-time users. In alignment with Article 11 of the WHO Framework Convention on Tobacco Control (FCTC), India has progressively strengthened its PHW policy since 2008, increasing coverage from 40% to 65% in 2014, and to 85% in 2016. The current mandate by the Ministry of Health and Family Welfare requires 60% of the principal display area to depict graphic images of severe health harms, and 25% for textual warnings and a national quit-line number.
Intervention or response: While regulatory design provides the backbone of PHW implementation, integrating behavioural science is critical to ensure these warnings influence perception, motivation, and behaviour. Recognizing this, the Centre for Communication and Change-India, with WHO support, conducted five rounds of pre-tests over a decade using dummy packs. These were evaluated using behaviourally informed parameters: noticeability (grabbing attention in cluttered environments), credibility (linking images with believable health risks), comprehension (across literacy levels), legibility (visual clarity), informativeness (actionable cues like quit-line numbers), and emotional resonance (evoking fear, disgust, or concern to trigger quitting or resistance to initiation).
These parameters draw from behavioural insights such as framing effects, loss aversion, etc. to disrupt habitual use and activate quit intentions. Focus group discussions and in-depth interviews with users, non-users, and retailers across three culturally diverse settings ensured contextual and behavioural relevance.
Results/Impact: Impact data underscore this approach's success. Between GATS 2009-10 and GATS 2016-17, adults considering quitting due to warnings increased by 83.6%. The toll-free quit-line saw a 7.7-fold rise in daily calls (6,064), with a 3.3-fold increase in registrations and a 264.5% increase in quitters.
Conclusions: Behaviourally informed PHWs go beyond visibility to drive real change, making tobacco warnings more salient, credible, and effective in reducing use.

SOA09-605-20 Amplifying TB treatment uptake through strategic engagement of corporate laboratories in UP and Delhi, India

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in India, with underreporting and delayed treatment common in the private sector. In 2023, 2.5 million PwTB were notified, with 33% (8.4 lakh) reported by private providers. Laboratories accounted for 20% (1.7 lakh) of these, but gaps in timely reporting and linkage to treatment persist. Strengthening collaboration between public health systems and private corporate diagnostic networks is vital to bridge this gap and advance TB elimination goals.
Intervention or response: Under Project SSHAKTI, HLFPPT launched a corporate engagement initiative to accelerate TB elimination by integrating private sector resources through collaboration with corporate hospitals, labs, and online health providers. this intervention en-

hances diagnosis, treatment, and care services in private settings, especially in Corporate hospitals and Corporate Laboratories chains. The intervention promoted the use of Annexure 15A, a standardized the National Tuberculosis Elimination Program (NTEP) Test Request Form, to ensure accurate data capture. Activities included mapping private labs, consultative meetings, conducting national consultations with key stakeholders, and organized 23 capacity-building sessions. In total, 821 lab personnel from 11 major corporate lab chains (covering 437 labs and 10,000 collection centres across 28 states) were trained.
Results/Impact: Before the intervention, 84% of Persons with TB diagnosed in private labs were not enrolled at the first point of contact. By Q1 2025,this dropped to 67%, showing a 33% relative improvement in timely PwTB enrolment at appropriate health facilities. Treatment initiation increased by 49%, indicating stronger linkages and a more effective public health response.
Conclusions: Engaging corporate labs and emphasizing the importance of notifying Persons with TB at the first point of contact—paired with sustained handholding of referral facilities—has significantly improved PwTB enrolment and treatment uptake, reinforcing the national TB elimination strategy.

SOA10 Reducing risk for close contacts of people with TB: Find, treat, prevent

SOA10-606-20 Finding TB through community-led interventions: Using clinically diagnosed people with TB to reach their social contacts for TB investigations in Wakiso district, Uganda

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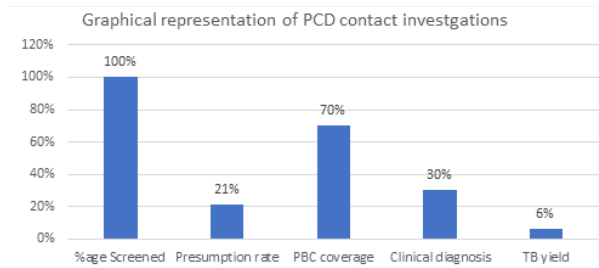
Background and challenges to implementation: Persons with pulmonary clinically diagnosed TB (PCD TB) disease are generally considered to be less infectious than those with pulmonary bacteriologically confirmed tuberculosis (PBC TB) disease. For this reason, their social contacts are not often prioritized for investigations. However, even when they present as the index patient, a suspicion remains that they may have contracted the disease from an undiagnosed and untreated person with PBC TB. It is upon this background that we investigated to evaluate social contacts of PCD TB patients under four health facilities in wakiso district, Uganda.
Intervention or response: Between July 2024 and March 2025, a team of health workers and community health workers identified newly diagnosed index PCD TB patients. These patients were interviewed and their social contacts enlisted. The team visited these contacts and assessed them for TB disease using symptom screening. Sputum samples were collected from those presumed to have TB and the samples were transported to the laboratories for GeneXpert testing.
Results were returned to patients by the community health workers who also escorted those with positive tests to the health facilities for TB treatment. HIV testing was provided to those eligible as per national guidelines. Contacts who were not diagnosed with TB were provided TB preventive therapy.
Results/Impact: Twenty-five (25) PCD patients were interviewed and 159 contacts were enlisted and screened. Those presumed to have TB were 33 (21%), Bacteriologically confirmed cases were 7 (70%) 3 were clinically diagnosed (30%) and the TB yield was 10 (6%). None

was diagnosed with HIV. All patients were started on TB treatment and all contacts without TB were provided TB preventive therapy.



Conclusions: Pulmonary clinically diagnosed (PCD)TB patients are an important entry point for identification of undiagnosed TB patients in our communities hence their contacts should be prioritized for investigations**.**

SOA10-607-20 Chest radiographic TB screening using human vs. artificial intelligence reads in asymptomatic adult household contacts in South Africa

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Background: Digital chest radiographs (dCXR) are increasingly used for community tuberculosis (TB) screening. We compared dCXR screening by human readers and artificial intelligence among symptomatic and asymptomatic household contacts of TB patients.
Design/Methods: Adults (≥18 years) with recent household TB exposure were enrolled (March 2021-December 2022) in Worcester, South Africa. Baseline procedures included symptom screening, dCXR, and sputum Xpert Ultra and liquid culture. Microbiologically-confirmed TB was defined as positive sputum culture and/or Xpert Ultra.
Asymptomatic TB was defined as microbiologically-confirmed TB in participants who did not have, recognize, or report TB symptoms. dCXR features suggestive of TB (cavity, opacity, miliary pattern, tracheal shift, collapsed lung, or pleural effusion) were reported as compatible with TB. Anonymised dCXR were reviewed by two independent readers (R1 and R2), blinded to symptoms and results. Discordant cases were reviewed by a third reader (R3); majority (2/3) results are reported. dCXR images were read by qTrack (Qure.AI, India), using the manufacturer's TB threshold (50). Human and qTrack reads were evaluated for concordance, sensitivity, and specificity.
Results: 445 participants (mean age 37.6 years; 65% female) enrolled. Of the 445, 42 (9.4%) had microbiologically-confirmed TB, of whom 30/42 (71.4%) were asymptomatic. Human reader sensitivity ranged from 50.0-59.5% for all TB, 50.0-63.3% for asymptomatic, and 50% for symptomatic TB (Table). qTrack detected 27/42 (64.3%, 95%CI 48.0-78.4) of all TB, 20/30 (66.7%, 95%CI 47.2-82.7) of asymptomatic, and 7/12 (58.3%, 95% CI 27.7-84.8) symptomatic TB. Concordance between R1 and R2 was 93.5% (Cohen's kappa 0.71); between human readers (2/3) and qTrack, 93.7% (kappa 0.72).
Conclusions: Among TB-exposed household contacts tested regardless of symptoms, dCXR readings by human and qTrack showed good agreement. qTrack sensitivity was marginally better than human readers, but below the WHO target product profile sensitivity for a screening test (90%), for asymptomatic and symptomatic TB screening.

SOA10-608-20 Role of cadres to increase finding TB through contact investigation based on household and community outreach in Palangkaraya City and Kotim District

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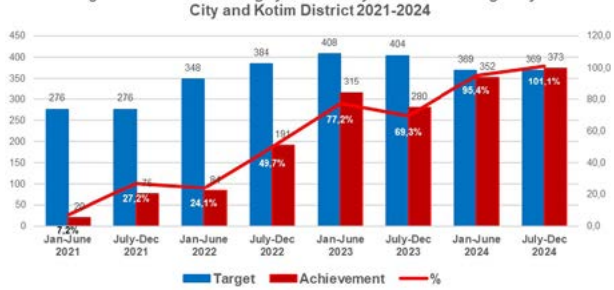
Background and challenges to implementation: Two areas with highest TB burden in Central Kalimantan (Borneo) Province are Palangkaraya City and Kotim District, with an estimated number of TB cases 1.299 and 953 respectively. In 2021, only 55% and 33% TB cases were notified. Since 2021, a community-based interventions to increase TB case finding and improve treatment outcomes have been implemented by Penabulu-STPI supported by Global Fund, so starting 2022 there was happened a significant increase in notifications.
The objective of this study is to describe contribution of community health cadres (CHCs) to TB case finding through household contact investigation (CI) and community outreach (CO) between 2021 to 2024 in Palangkaraya City and Kotim District.
Intervention or response: Early 2021, recruitment and training of 60 CHCs was carried out on TB disease and how to conduct CI and CO to find new TB cases. Most CHCs aged 30-45 years (61%), have high education (90%), women (73%)-as housewife (99%). CHCs received incentive from Global Fund for performing CI and CO. CHCs also trace cases index who had changed address. CO activity involves group and individual visits—primar-

ily door-to-door visits in slums, densely populated neighborhoods, and poor communities while carrying sputum containers and encouraging symptomatic individuals to provide samples on-site.

Results/Impact: Figure 1 shows a significant rise in TB case finding from July–December 2022 and peaked until 101% in July–December 2024. According to Central Kalimantan Provincial Health Office, overall TB case detection rate in 2024 has reached 72.5% (targeted 90%), with two area interventions supported by community cadres making significant contributions of 101.1% and 86.3% respectively.

Figure 1: TB Case Finding by Community Cadres at Palangkaraya City and Kotim District 2021-2024



Conclusions: Community cadres play a crucial role in enhancing TB case detection. As grassroots community member, they have easier access to local populations and build stronger trust than government-employed health workers, making them effectively in identifying and referring TB cases.

SOA10-609-20 A novel bioinformatics household linkage technique reveals populations at high risk for TB infection within a multi-state US community health network

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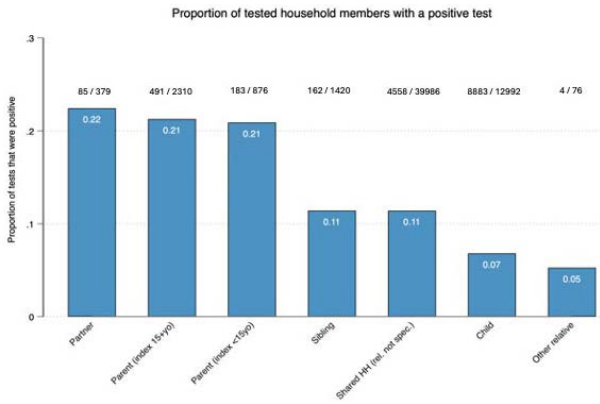
Background: Although household testing is a mainstay of tuberculosis (TB) *disease* detection and prevention, few studies leverage households as a locus of TB *infection* clustering in the absence of individuals with known disease. Identifying patterns of household TB infection clustering could enable new, family-centered strategies to diagnose and treat TB infection in low-burden settings.

Design/Methods: We adapted a novel bioinformatics linkage technique to identify household members within OCHIN, a community health center organization serving patients in 40 US states. From OCHIN's research network, we identified all individuals ("index patients") with a positive TB tuberculin skin test (TST) or interferon gamma release assay (IGRA) between 2012-2023, without TB disease. We then linked index patients to "household members" who shared an address with index patients. When multiple individuals in the same household had positive tests, we classified the individual with the first test as the index patient.

Using additional administrative data, we determined the relationships between index patients and household members. We described test positivity by relationship.



Results: We identified 52,378 index patients with a positive TST or IGRA, who were linked to 186,054 unique household members in the OCHIN network. Among household members, 64,460 (35%) had a documented test. Of these, 58,039 (90%) had a valid result, of whom 6,366 (11%) tested positive. We identified high (>20%) test positivity among partners and parents of index patients.

Conclusions: We adapted a novel linkage technique to characterize household TB infection clustering within a multi-state US community health organization network. We found that testing parents and partners of individuals with TB infection may be a high-yield strategy to close TB infection detection gaps in low-burden settings.

SOA10-610-20 Harnessing digital innovations for enhancing contact tracing, early diagnosis and prevention of TB in 15 selected districts of Sindh, Pakistan

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Background and challenges to implementation: Despite being preventable and curable, TB remains a leading infectious disease in Pakistan, with Sindh among the high-burden regions. Weak referral-systems, fragmented data-flows, and delays in diagnosis have long hindered efforts. There was a critical need to digitize service delivery and enhance targeted outreach to vulnerable populations.
Intervention or response: Aligned with National TB Guidelines and digital health standards, USAID's IHSS-SD Activity introduced a suite of digital innovations to strengthen TB response in 15 districts.
Key components included TB Management and Analytical Dashboards for real-time data aggregation, performance-tracking, and evidence-based decision-making. The TB Outreach App, is used by trained social mobilisers for automated household contact-tracing, TB screening, and treatment follow-up, while TB HTL App facilitates digital referrals in 30 secondary & tertiary hospitals, using built-in diagnostic algorithms to support TB diagnosis and linkage to care.
To increase detection among hard-to-reach populations, five mobile TB-vans equipped with ultra-portable X-rays, CAD4TB software, and GeneXpert systems were deployed. The approach also integrates hotspot mapping, using cluster analytics from index-case data to target high-risk communities—such as prisons, madrassahs, and urban slums, improving outreach efficiency.
Results/Impact: The initiative screened 56,414 contacts from 9,704 households, including 23,826 children under 15, leading to 785 TB diagnoses. Mobile vans screened 27,233 individuals including 10,148 inmates and 12,242 madrassah students. Hotspot mapping proved pivotal in directing screening resources, reflecting global best-practices for targeting key/vulnerable populations, as recommended by the WHO End TB Strategy. Digital innovations enhanced service transparency, reduced diagnostic delays, and fostered integrated data use at all system levels.
Conclusions: This digitalisation demonstrates a scalable, people-centered, and data-driven approach to TB care, strengthening contact-tracing, diagnosis, and prevention in high-burden settings. Its success in Sindh underscores value of digital tools and hotspot mapping for efficient case-finding and targeted outreach. Wider adoption across provinces and similar contexts can accelerate progress toward TB elimination.

SOA10-611-20 Enhancing finding TB through optimized screening: Lessons from the spot to tent onion model (STOM) of contact investigation

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Background and challenges to implementation: Active Case Finding (ACF) strategies such as contact investigation and house-to-house screening are key elements of TB control in high-burden countries like Nigeria. These strategies are important to reach undiagnosed individuals not presenting to health facilities, which is critical to minimizing community spread.
This study evaluates the effectiveness of Spot to Tent Onion Model (STOM) of TB contact investigation in Akwa Ibom, Nigeria as an optimized approach for TB screening within the community
Intervention or response: Implemented between October 2022 and November 2023 by KNCV Nigeria, the STOM model employed two complimentary approaches. The "spot" involved screening household contacts of confirmed index TB cases from DOT facilities, while the "tent" extended TB screening to households within a 2-kilometer radius of the "spot."
This strategy enabled a more comprehensive reach, facilitating the identification of both missing and newly diagnosed TB cases while addressing the cultural sensitivities associated with household visits, promoting community cooperation, and reducing stigma.
Results/Impact: A total of 22,248 household contacts in the "spot" and 180,483 extended contacts within the "tent" were screened for TB. The model achieved an 8% TB yield from 402 household contacts newly diagnosed for TB and a 5% TB yield from 568 extended contacts newly diagnosed for TB in the "spot" and "tent" interventions, respectively. The dual approach not only increased the reach of TB screening using the same resources, but also contributed an additional 568 newly diagnosed cases which would have been missed, proving the effectiveness of an extended screening radius.

Indicator	SPOT	TENT	STOM
Contacts identified	22,341	180,671	203,012
Number of household/extended contacts screened for TB	22,248	180,483	202,731
Number of household/extended contacts presumed to have TB	5,001	12,541	17,542
Number of presumptive clients evaluated for TB	4,918	12,326	17,244
Number of contacts diagnosed with TB (all forms)	402	568	970
TB cases notified and started on treatment	399	545	944
TB Yield	8%	5%	6%

Conclusions: The "tent" approach contributed nearly 59% of all newly diagnosed TB cases within the period, highlighting the effectiveness of the STOM model's dual strategy in finding missing TB cases. This innovative model is recommended for high-burden settings, especially where stigma and access barriers hinder the effectiveness of traditional screening methods

SOA10-612-20 The value of contact investigation in a human population affected by bacteriological confirmed *M. bovis*

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Background and challenges to implementation: Contact investigation is a key part of the tuberculosis (TB) policy in the Netherlands, focusing on early detection, treatment, and prevention of transmission and is conducted using the stone-in-the-pond principle. Risk assessment forms a basic approach to the organization of contact investigation for individuals affected by *Mycobacterium tuberculosis* complex. Two recent cases illustrate the importance of contact investigation in both humans and domestic cats affected by *Mycobacterium bovis (M. bovis)*.
Intervention or response: The first case involves a Dutch adolescent employed in an animal food processing factory, diagnosed with smear-positive pulmonary tuberculosis caused by *M. bovis*. The second case concerns a feline post-mortem diagnosis with bacteriological positive *M. bovis* pulmonary tuberculosis.
Results/Impact: The first case led to the investigation of 11 close contacts, revealing TB infection in four individuals, all colleagues handling raw meat. No TB infections were found among 14 additional colleagues from other departments. Since the index patient had no other *M. bovis* risk factors, the infection likely stemmed from the workplace. Unfortunately, the source was not identified, attributed to incomplete registration by the processing factory.
In the second case, four domestic cats died from *M. bovis* TB. Another cat and dog in the household were diagnosed with possible TB and started treatment. The most likely source being raw cat food. Six human contacts were investigated, revealing one person affected by TB and three TB infections. Among 11 colleagues from a local veterinary clinic, one colleague had a positive IGRA.
Whole genome sequencing (WGS) indicated different *M. bovis* strains in both cases.
Conclusions: These data highlight the importance of contact investigation in both humans and felines affected by *M. bovis*TB, as it enables the identification and treatment of infected individuals, preventing further spread of the disease.

SOA10-613-20 Improving contact tracing and TB diagnosis in children in a drug-resistant TB programme in Punjab province, Pakistan

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Background and challenges to implementation: Médecins Sans Frontières (MSF) supports the National and Provincial TB Programs of Punjab, Pakistan to provide comprehensive care for patients affected by DR-TB in Gujranwala. Diagnosing children has been a challenge since the outset, with only 8/139 (6%) and 3/136 (2%) patients < 15 year olds enrolled in 2022 and 2023 respectively.
We describe steps taken to increase diagnosis amongst children through improving contact tracing and investigation.
Intervention or response: Due to logistical challenges to perform X-ray, initially contact investigation was done using systematic Xpert testing with sputum or stool samples, according to the age of the contact. As this method did not identify many children with TB, from May 2024, X-ray and clinical examination became the screening methods for contacts <10 years old. As there was only one scheduled pediatric clinic per week, a backlog of children waiting for assessment developed until the number of pediatric clinics increased to 3 times per week.
Results/Impact: From May to December 2024, of 422 contacts <15 years old investigated, 116 (28%) were identified with presumptive TB by clinical and/or radiological signs, 30 (7%) were diagnosed with DR TB and 3 were diagnosed with drug-susceptible TB (DS TB).
Of 143 contacts (34%) with Xpert examination, 12 (8%) had a trace result and 1 had a positive, rifampicin susceptible result. Of patients with a trace result, 3/12 started DR-TB treatment, 2/12 started DS TB treatment, 7/12 (58%) had no clinical or radiological signs of TB and were followed-up without treatment.
Overall, the proportion of <15 year olds enrolled in DR TB treatment increased to 20% (41/209) in 2024.

Conclusions: Investing in clinical evaluation of children who are household contacts of DR TB cases improves diagnosis in this group. Research is needed to understand the significance of trace results in contacts with no clinical or radiological sign of TB.

SOA10-615-20 Optimising TB preventive therapy: A comparative study of completion rates for isoniazid (6H) and isoniazid-rifampicin (3HR) regimens, USAID TB LON 3 project experience

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Background: Tuberculosis (TB) remains a major public health challenge in Nigeria, necessitating effective preventive strategies, especially among high-risk populations. The USAID TB LON 3 project in Lagos implemented two WHO-recommended TB preventive therapy (TPT) regimens: the traditional six-month isoniazid monotherapy (6H) and the shorter three-month isoniazid and rifampicin combination regimen (3HR). While both regimens are efficacious, evaluating real-world completion rates is crucial to optimize programmatic impact in high-burden, resource-limited settings. This study compared the completion rates of both regimens, stratified by gender, to guide scalable, evidence-informed decisions.
Design/Methods: A retrospective cohort analysis of routine program data was conducted from July to December 2023, involving 2,126 clients initiated on TPT (6H: n=1,727; 3HR: n=399). Treatment completion was defined as finishing the full course within the expected timeframe. Completion rates were calculated for each regimen and stratified by gender. Chi-square tests at a 0.05 significance level assessed statistical differences in completion between regimens and gender groups.
Results: Clients on the shorter regimen had a significantly higher completion rate (90.5%) compared to those on 6H (72.2%). Gender-disaggregated analysis showed marginal differences: females had slightly higher completion on 6H (72.7%) than males (71.7%), while males outperformed females on the shorter regimen (92.5% vs. 88.9%). The difference in regimen completion rates was statistically significant (χ^2=78.4, p<0.001), while gender-based differences were not (χ^2=1.2, p=0.27).

July-Dec., 2023, Uptake	Started on TPT Male	Started on TPT Female	Completed TPT Male	Completed TPT Female	Completion Rate
6H	801	926	574	673	72.2%
3HR	173	226	160	201	90.5%

Conclusions: The shorter regimen demonstrated significantly higher completion rates than 6H, likely due to reduced duration and pill burden, enhancing adherence. No significant gender disparity was observed, indicating equitable uptake. To improve TPT outcomes, scaling up the shorter regimen is recommended. Further research should explore barriers to 6H completion, while sustaining gender-responsive approaches to service delivery. Cost-effectiveness and long-term outcome analyses are also crucial to inform national TB prevention policies and ensure efficient, equitable, and evidence-based scale-up in high-burden settings like Nigeria.

SOA10-616-20 Safety monitoring and completion rates of once-daily isoniazid and rifapentine (1HP) among high-risk populations

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Background: To improve tuberculosis infection (TBI) treatment adherence, Taiwan introduced a 28-day regimen of isoniazid 300 mg plus rifapentine 600 mg (1HP) in 2021 for people living with HIV (PLHIV) and inmates. Domestic trials confirmed its safety and comparable completion rates to the 3-month once-weekly regimen (3HP) among PLHIV and TB contacts in 2020 and 2022, respectively. In 2023, Taiwan CDC expanded 1HP access to all eligible TBI patients. This study compares the safety of 1HP and the 3HP fixed-dose combination (3HP FDC).
Design/Methods: A nationwide pharmacovigilance project was implemented using the TB case management system, Taiwan's National Adverse Drug Reaction Reporting System, and the Taiwan Drug Relief Foundation database. Adverse events (AEs) and severe adverse events (SAEs) leading to permanent discontinuation were analyzed among patients receiving 1HP from 2019 to March 2024 with follow-up until July 2024.
Results: Among 3,320 individuals treated with 1HP, 31.9% were aged 50–64 years. A total of 13.6% discontinued treatment permanently; 11.7% were due to AEs, comparable to the 9.2% in 3HP FDC users (p=0.079). Rash was more common with 1HP (4.8% vs. 2.0%, p=0.031), as were systemic drug reactions (6.9% vs. 3.9%, p=0.047).

SAEs considered highly likely to be drug-related (Naranjo score>=9) occurred in 0.1% of 1HP and 0.2% of 3HP FDC users (p=0.079). Nine patients (0.3%) developed hepatitis with serum alanine aminotransferase (ALT) ≥ 5x upper limit of normal reference (ULN), and 1.1% had jaundice (total bilirubin ≥2 mg/dL) with no different from 3HP-FDC users (0.3% vs. 0.4%, p=0.121; 1.1% vs. 0.6%, p=0.067); all recovered after discontinuing treatment. The treatment completion rate was 86.1%.

Conclusions: This national pharmacovigilance analysis confirms that 1HP has a comparable safety profile to 3HP FDC. These findings support broader clinical adoption of 1HP, helping to expand access to shorter, effective TBI treatment and improve overall adherence.

SOA10-617-20 Risk of progression to incident pulmonary TB among household contacts with abnormal chest X-rays in South Africa

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Background: Close contacts of tuberculosis (TB) patients who have chest X-ray (CXR) abnormalities (CXR+), but negative *Mycobacterium tuberculosis* sputum results (Micro-), are at elevated risk of progressing to incident pulmonary tuberculosis (PTB), with rates estimated to be as high as 10% per annum. We evaluated factors associated with the CXR+ Micro- phenotype and assessed the risk of progression to active PTB.

Design/Methods: Adult (≥18 years) household contacts of index PTB patients were prospectively evaluated at three sites in South Africa. Participants without microbiologically-confirmed (sputum liquid culture and/or Xpert Ultra positive) PTB, regardless of baseline CXR findings, were followed for up to 12 months for incident PTB. Multivariable logistic regression was used to identify factors associated with the CXR+ Micro- phenotype. Risk ratios were used to assess risk of progression to microbiologically-confirmed incident PTB by baseline CXR and interferon-γ release assay (IGRA) results.

Results: Between May 2021 - September 2022, 978 household contacts were enrolled. Of these, 799 were Micro- and had a baseline CXR result, with 159/799 (20%) showing CXR abnormalities. Factors significantly associated with abnormal CXR were increasing age (adjusted odds ratio [aOR] 1.03 per year [95%CI 1.02-1.05], p<0.001) and a prior history of TB (aOR 6.67 [4.33-10.27], p<0.001) after adjusting for study site (*Table 1*).

Demographics clinical characteristics*	Categories	Total (n=799)	CXR abnormal (n=159)	OR (95% CI)	p-values	aOR (95% CI)	p-values
Median Age (years, IQR)		34.8 (25.4 – 45.0)	42.8 (30.4 – 53.2)	1.03 (1.02 – 1.04)	<0.001	1.03 (1.02 – 1.05)	<0.001
Sex, n (%)	Female	513 (64.2)	95 (59.7)	0.79 (0.55 – 1.12)	0.193	0.75 (0.48 – 1.15)	0.190
Ancestry, n (%)	Mixed	412 (51.6)	110 (69.6)	2.55 (1.76 – 3.71)	<0.001	1.39 (0.76 - 2.54)	0.293
History of smoking, n (%)	Current Smoker	418 (52.3)	99 (62.3)	1.90 (1.30 – 2.78)	<0.001	1.47 (0.90 – 2.40)	0.214
	Former Smoker	39 (4.9)	12 (7.6)	2.72 (1.29 – 5.74)		1.76 (0.74 – 4.24)	
Prior TB, n (%)	Yes	148 (18.5)	76 (47.8)	7.22 (4.86 – 10.74)	<0.001	6.67 (4.33 – 10.27)	<0.001
HIV positive, n (%)	Yes	131 (16.9)	24 (15.7)	0.90 (0.55 – 1.45)	0.657		
Study site, n (%)	Worcester	361 (45.2)	82 (51.6)	2.52 (1.61 – 3.93)	<0.001	2.14 (1.07 – 4.26)	0.03
	Ravensmead	141 (17.8)	46 (28.9)	4.15 (2.48 – 6.93)		5.55 (2.63 – 11.73)	

Table 1: Baseline characteristics and risk factors associated with an abnormal chest X-ray among individuals without pulmonary tuberculosis.
Analysis only for TB contacts with available chest X-ray (CXR).
**The ancestry reference is Black/African – Caucasian estimates not reported (2 individuals in the study); History of smoking reference is never smoked; Study sites reference is Klerksdorp site.*

The risk of progression to incident PTB was 4.02 [95%CI: 1.02-15.92] times higher in the CXR+ compared to the CXR- group (p=0.03). The risk of progression to incident PTB was similar between IGRA+ and IGRA- groups (risk ratio = 0.48 [0.12-1.99], p=0.30).

Conclusions: Individuals with CXR abnormalities and negative microbiological tests—who would not routinely be treated for TB disease at baseline had a fourfold increased risk of progression to incident TB. Optimal preventive or curative therapies for this high-risk phenotype should be considered in screening guidelines for TB-exposed household contacts.

SOA11 Bridging gaps in TB care: AI solutions for high-risk populations

SOA11-618-20 How subtle is asymptomatic pulmonary TB? Lessons from using digital chest X-ray with computer aided detection software for TB case finding in communities in Uganda

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Background and challenges to implementation: Despite global efforts, the slow decline in tuberculosis (TB) incidence highlights the need for innovative case-finding strategies. Asymptomatic pulmonary tuberculosis remains a significant challenge, as individuals often lack observable symptoms that would prompt diagnostic evaluation.

This study evaluates the potential of community-based active TB case finding through mobile clinics equipped with digital X-ray and computer-aided detection (CAD) software to enhance early detection of TB and treatment initiation.

Intervention or response: The Uganda National Tuberculosis and Leprosy Program deployed two mobile clinics, each fitted with digital X-ray and CAD technology, targeting hotspots and high-risk communities based on TB disease burden. Sputum samples were collected from individuals with abnormal chest X-rays (CAD4TB score ≥50) and/or presence of TB symptoms, for analysis using X-pert MTB/RIF Ultra.

Asymptomatic TB was defined as bacteriologically confirmed TB that does not meet the WHO TB screening criteria for diagnostic evaluation, that is: "no persistent cough for two or more weeks".

Results/Impact: Between February and June 2024, 7243 individuals were screened with digital X-rays, of whom 464 (6.4%) individuals had abnormal X-rays (CAD4TB score > 50).

A total 1,335 sputum samples were collected from those with abnormal imaging and/or TB symptoms, and 99 (7.4%) patients were bacteriologically confirmed. Of these, 48% had asymptomatic TB (cough <2 weeks: 31% and No TB symptom: 17%), underscoring the limitations of relying solely on symptom-based screening. The positivity rate of TB among individuals with abnormal X-ray (CAD score ≥50) was 21% compared to 0.8% among those with normal chest X-ray.

Symptom profile	CAD score	Number screened with CXR and CAD	Number tested with Xpert MTB/RIF	Number bacteriologically confirmed TB	TB positivity rate (%)	Proportion out of all TB cases (%)
Persistent cough for 2 weeks or more	≥ 50	241	237	46	19.4	52
	< 50	1,772	508	5	1.0	
Cough < 2 weeks	≥ 50	173	161	35	21.7	37
	< 50	3,322	356	2	0.6	
No TB symptoms	≥ 50	50	40	11	27.5	11
	< 50	1,685	33	0	0	
Total	≥ 50	464	438	92	21.0	
	< 50	6,779	897	7	0.8	
		7,243	1,335	99	7.4	

Conclusions: Nearly half of the TB patients identified in this community-based screening initiative were asymptomatic. Deployment of digital X-ray and CAD technology enabled detection of cases that might otherwise go unnoticed.

National TB programs and partners are encouraged to prioritize integration of digital X-ray and CAD in TB screening efforts to improve early detection and treatment outcomes.

SOA11-620-20 Enhancing paediatric TB screening: Validation of an enriched artificial intelligence-based computer aided detection model using chest X-rays from children under 15 years

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Background: Children account for 12% of the global TB burden and 16% of TB-related deaths, with the majority of deaths occurring in children who were never initiated on treatment. Pediatric TB diagnosis is particularly difficult due to paucibacillary disease, non-specific symptoms, and the challenge of interpreting pediatric chest X-rays (CXRs), especially in resource-limited settings.

Although AI-based computer-aided detection (CAD) tools are WHO-endorsed for adult TB screening, they have shown limited performance in children. We enriched the qXR v4.2 CAD (Qure.ai) with pediatric CXRs and evaluated its performance against the microbiological reference standard (MRS).

Design/Methods: The qXR model was further trained using 23,913 pediatric CXRs (37% GeneXpert-positive) with GeneXpert results as training label and validated the enriched algorithm on 5,845 CXRs from children aged 0–14 years. Area-under-the-receiver-operating-characteristics-curve (AUROC), sensitivity, and specificity were calculated overall and by age bands (0–4, 5–9, 10–14 years) against MRS. Thresholds aligned with WHO Target Product Profile (TPP) were also evaluated.

Table 1. Performance of enriched AI-CAD model with AUROC, sensitivity and specificity at various thresholds and across age bands

	AUROC	Se and Sp at optimal threshold*		Se and Sp at threshold of 0.5		Se and Sp at thresholds yielding WHO TPP	
	AUROC (95% CI)	Se (95% CI)	Sp (95% CI)	Se (95% CI)	Sp (95% CI)	Se at 70% Sp (95% CI)	Sp at 90% Se (95% CI)
Overall n=5845 n_{TB}=1122	0.925 (0.918, 0.932)	88.4 (86.4, 90.2)	81.3 (80.1, 82.4)	82.1 (79.7,84.3)	85.5 (84.5, 86.5)	96.5 (95.3, 97.6)	79.1 (77.1, 81.6)
0-4 n=2572 n_{TB}=212	0.957 (0.948, 0.966)	92.9 (88.6, 96.0)	86.4 (84.9, 87.8)	76.9 (70.6, 82.4)	93.4 (92.3, 94.4)	99.5 (98.6, 1.00)	88.1 (84.6, 90.3)
5-9 n=1725 n_{TB}=437	0.898 (0.882, 0.913)	84.2 (80.4, 87.5)	80.6 (78.3, 82.7)	83.1 (79.2, 86.5)	80.9 (78.6, 83.0)	90.6 (87.2, 93.6)	70.8 (65.5, 77.6)
10-14 n=1548 n_{TB}=473	0.883 (0.867, 0.900)	91.1 (88.2, 93.5)	67.9 (65.0, 70.7)	83.5 (79.9, 86.7)	73.9 (71.1, 76.5)	88.4 (83.9, 92.4)	68.6 (64.2, 72.5)

AUROC: Area under the receiver operating characteristic curve
n: Number of cases
n_{TB}: Number of cases who were bacteriologically confirmed positive for the presence of TB disease
Numbers in parentheses indicate the 95% confidence interval (95% CI)
Se: Sensitivity; Sp: Specificity
* The optimal threshold based on Youden's index for the overall group and for subgroups 0-4, 5-9 and 10-14 were 0.401, 0.245, 0.494 and 0.401, respectively.

Results: Out of 5,845 CXRs, 1,122 (19.2%) CXRs were from children who had GeneXpert confirmed TB, with median age 5 years (IQR:3-10). The enriched model achieved an overall AUROC of 0.925 (95% CI: 0.918–0.932) against MRS. Sensitivity and specificity at optimal threshold were 88.4% (86.4-90.2) and 81.3% (80.1-82.4), respectively.

The model met WHO TPP benchmarks with 96.5% sensitivity and 79.1% specificity, at 70% specificity and 90% sensitivity. Performance was higher in 0–4 years (AUROC: 0.957) than in 10–14 years (AUROC: 0.883). An exploratory analysis using the adult qXR model for older children showed no added improvement.

Conclusions: The enhanced qXR demonstrated strong performance, especially in younger children, and offers a scalable tool for early TB detection in settings with limited pediatric radiology expertise.

Further studies incorporating clinically diagnosed TB (unconfirmed TB) and distinguishing severe from non-severe cases are needed to strengthen screening programs.

SOA11-621-20 Adaptive artificial intelligence for TB screening: Automated age prediction from chest X-rays to improve paediatric TB detection in low-resource settings

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Background: Pediatric TB causes about 200,000 deaths annually, due to diagnostic challenges such as paucibacillary disease, difficulty obtaining sputum, and subtle clinical presentation. CXR findings vary-hilar lymphadenopathy commoner in children <5 years, while adolescents often present with adult-like patterns. AI tools like qXR used in community-based screening, but unlike in adults, have limited evidence in children. Also, using a single threshold across all age groups would affect sensitivity.

We propose an AI based age regression model to predict age directly from CXR, enabling age-specific thresholds and enabling health workers to use AI without the need for age metadata.

Design/Methods: We developed a ResNet-18-based model to estimate age from CXRs, trained on 677,475 CXRs (51,880 pediatric, 625,595 adult), using 16 years as the classification threshold. The model performance was tested on 110,007 CXRs (8,414 pediatric, 101,593 adult) for age prediction using R^2 (for prediction accuracy) and RMSE (for the average error in years), and precision, recall, and F1 score for classification, with results stratified by age bands.

Table 1: Prediction accuracy of the age adaptive AI model for various age bands

Age Group (yrs)	Samples	Recall/Sensitivity (%)	F1 Score (%)	False Negatives
0–3	2,632	99.5	99.7	14
3–6	1,627	98.9	99.4	18
6–10	1,523	99.5	99.8	7
10–16	2,632	89.4	94.4	280
16–30	26,784	99.3	99.7	178
30–50	34,595	99.8	99.9	59
50–100	40,214	99.93	99.94	30
Pediatric Total	**8,414**	**96.2**	**96.5**	**319**
Adult Total	**101,593**	**99.7**	**99.7**	**267**

Results: The model predicted age with high accuracy- R^2 = 0.932; RMSE = 5.15. For pediatric CXRs, R^2 was 0.58 and RMSE 3.32. At 16-year threshold, binary classification yielded strong pediatric performance: precision 96.8%, recall 96.2%, F1 score 96.5%. Out of the 319 false

negatives & 267 false positives, majority were in the 10–16 age band due to adult-like radiographic features. Age-stratified recall exceeded 98.9% for children aged 0–10 and 89.4% for ages 10–16. Adult classification remained highly accurate (recall/F1 >99.7%).
Conclusions: The model achieved 96.2% accuracy in pediatric classification, enhancing diagnostic precision through age-adaptive thresholds. By automating age estimation from CXRs, it bridges gaps in AI workflows, improving pediatric TB detection and enabling task-shifting to community health workers for more equitable, scalable screening in resource-limited settings.

SOA11-622-20 Predicting the burden of undiagnosed TB cases in India using a machine-learning approach

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Background: India bears one of the highest tuberculosis (TB) burdens globally, and despite active case-finding (ACF) initiatives, a substantial proportion of individuals with TB symptoms remain untested, contributing to the pool of undiagnosed or 'missing' cases. Estimating this hidden burden is critical for strengthening surveillance and targeting interventions. This study applied machine learning (ML) techniques to predict undiagnosed TB cases among symptomatic individuals who were referred for testing but lacked recorded diagnostic outcomes.
Design/Methods: Data from 212,953 individuals with TB symptoms referred for diagnostic testing across four Indian states under a USAID-supported TB intervention (October 2021 – March 2024) were analyzed. Two ML models—logistic regression and support vector machine (SVM)—were trained on individuals with confirmed test results using features based on reported symptoms and a few demographic variables. The SVM model, optimized through class weighting and hyperparameter tuning, was selected for final predictions based on superior performance. Predictions were then made for symptomatic individuals with missing test results, and the potential burden of undiagnosed TB was estimated under varying assumptions (10–40%) of testing coverage gaps.
Results: Of the referred individuals, 12% lacked documented test results, and 6% (13,203) were diagnosed with TB. The final SVM model achieved an AUC of 0.751 with moderate sensitivity. Based on model outputs, the projected number of undiagnosed TB cases ranged from 210,584 (if 10% of symptomatic individuals were untested) to 1,248,519 (if 40% of symptomatic individuals were untested). These estimates aligned with the prevalence observed in the available dataset, supporting the model's applicability for population-level estimations.
Conclusions: This study highlights the utility of machine learning in enhancing TB surveillance by estimating the burden of undiagnosed cases. While not intended for individual diagnosis, the approach provides valuable insights for programmatic planning, emphasizing the need for improved diagnostic follow-through in TB care pathways.

SOA11-623-20 Improving digital TB screening efficiency in remote rural communities in Nigeria through offline and local intranet-based data synchronisation

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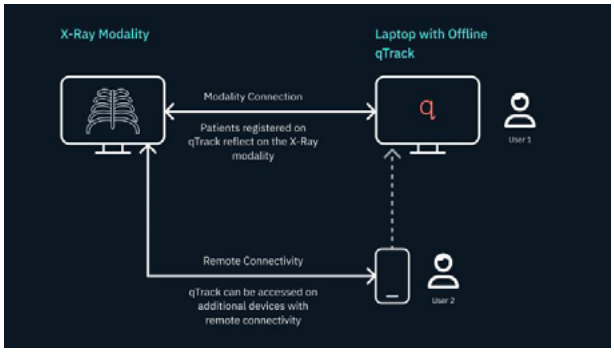
Background and challenges to implementation: AI-enabled digital X-ray technology has enhanced TB screening, but operational challenges persist in remote rural areas. Screening is usually confined to a single laptop, limiting efficiency and output. Expanding to multiple devices typically requires internet access, which is seldom available, hindering data synchronization and team coordination. This study outlines our experience deploying an offline, multi-point digital screening system during community outreaches.
Intervention or response: Caritas Nigeria utilized the traditional single digital laptop for TB screening and chest X-ray exposure from July 2023 to December 2023, then introduced multiple entry digital intervention in January 2024 across communities in Ebonyi State. An on-premise laptop equipped with Qure.ai's offline-compatible qTrack tool was deployed. The laptop served as a local intranet hotspot, allowing multiple smartphones used by outreach staff to connect without internet access. This configuration enabled simultaneous access to the TB screening worklist, synchronized with the central laptop for chest X-ray data capture. Screening data from both pre- and post-intervention periods were analyzed. Below is the post-intervention workflow:
Results/Impact: The implementation of the offline, multi-point screening system in January 2024 led to a 100% increase in TB screening efficiency. In the pre-intervention period (Jan–Dec 2023), only one health worker conducted screenings per community Outreach activity, resulting in 4,734 individuals screened. Post-intervention (Jan–Dec 2024), the use of a local hotspot enabled an average of three health workers to screen simultaneously, increasing

the number screened to 9,475. This multi-user approach significantly improved throughput and optimized the screening process in remote, low-connectivity areas.



Conclusions: This intervention offers a scalable solution for AI-powered TB screening in remote areas by using a single laptop as a local hotspot. It enables multiple workers to screen simultaneously with mobile devices, improving operational efficiency, extending diagnostic reach, and promoting health equity in underserved, low-connectivity communities.

SOA11-624-20 A retrospective evaluation of the MATCH AI model for prediction of TB positivity rates in active case finding settings of Pakistan

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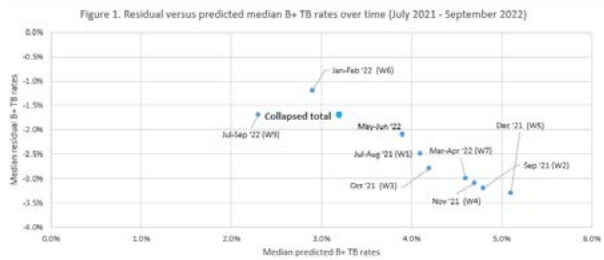
Background: While subnational TB burden estimation methods have gained traction in recent years, these are not routinely used to geographically target case-finding activities. Program planners are increasingly interested in assessing whether predictive models are useful in prioritizing local areas for TB active case-finding (ACF), especially in settings with substantial gaps in treatment coverage. Public and private sector TB partners in Pakistan are paving the way in use of models to plan ACF efficiently, to help close the gap in treatment coverage, estimated at 66% in 2023.
Design/Methods: We programmed a machine learning engine with variables of the MATCH framework to model bacteriologically positive (B+) TB positivity rates detectable in ACF settings per 10,000 population for all of Pakistan. Our research objectives were to retrospectively evaluate model performance across time (predictions updated over 9 time windows), geographic space, and socio-economic strata, by analyzing model residuals and area under the curve (AUC) scores.



Results: 1,999 ACF events were conducted in 169 tehsils of Punjab, Khyber Pakhtunkhwa, Balochistan and Sindh provinces between July 2021 and September 2022. The median observed B+ TB positivity rate was 1.5%, ranging from 1.2- 2.3% across all windows, while median residuals ranged from -1.2% to -3.3%.
The pooled Spearman's rank correlation coefficient was 0.1621 ($p<0.0001$). ANOVAs and residual analysis showed improved model accuracy in geographic areas that are less densely populated, had lower chest camp attendance, and are farther away from health facilities. Against a cut-off B+TB positivity rate of 0%, the pooled AUC score across nine ROC curves was 0.6325.
Conclusions: While the model's predictive accuracy did not improve over time, results of the stratified analysis of residuals shed light on potential model misspecifications. Results of the analysis contain important learnings about how machine learning models can more accurately prioritize ACF at the local level in resource constrained environments.

SOA11-625-20 Technical validation of Swaasa AI platform for detecting likely presence of pulmonary TB among people presenting with cough in India

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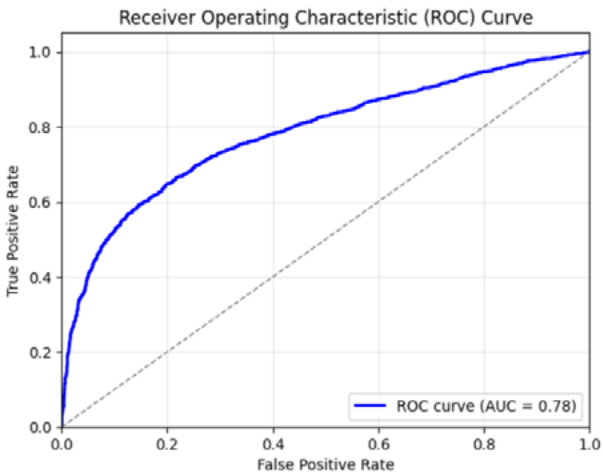
Background: Sub-optimal access to molecular diagnostic tests and chest X- ray hinders the case finding in tuberculosis (TB). Here we present the data on performance of an android mobile-based artificial intelligence platform, Swaasa, which uses cough sounds for diagnosis of pulmonary tuberculosis.
Design/Methods: The study, which started in May 2024, was conducted at five places in India: Ballabgarh, Delhi, Puducherry, Bhubaneswar and Gorakhpur.
The objective of the study was to further refine the AI algorithm by adding cough sounds from 3000 people with tuberculosis and 3000 people without tuberculosis. Four cough sounds were obtained from each person within one week of start of cough.
The diagnosis of tuberculosis was confirmed by positive finding on one of three diagnostic modality: sputum microscopy, any molecular diagnostic test or chest x-ray. Diagnosis of tuberculosis was ruled out if all the three were negative. 70% of the data were used to train the algorithm whereas 30% were used to assess the performance.
In this analysis, we have calculated sensitivity, specificity, and area under curve from first 4027 participants.



Results: Out of the total 4027 persons, data from 2747 were used to train the algorithm and data from 1280 were used to assess the performance. Out of 1280, 688 had tuberculosis and 592 did not have tuberculosis. 64% were males, and 32% were in the age group 30-49 years. The Swaasa AI platform achieved an area under curve of 0.78 with overall sensitivity of 72.2% (95% CI-70.4-74) and specificity of 71% (95% CI-69-72.8). Sensitivity and specificity was similar across gender. Sensitivity was 83% in those ≤29 years, and declined with age, falling to 53% in individuals ≥70 years.
Conclusions: The Swaasa AI platform exhibited good overall performance with better sensitivity in younger patients. The algorithm needs more training, especially using cough sounds from older people, for improvement in performance.

SOA11-626-20 Understanding asymptomatic TB: Insights from community-level screening using AI-enabled portable digital X-ray technology in remote rural Nigeria

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Background and challenges to implementation: Asymptomatic tuberculosis (TB) is an emerging public health concern that often goes undetected in routine TB screening, which typically relies on the presence of symptoms. This gap contributes to ongoing transmission, delayed care, and underreporting. AI-enabled chest X-ray technology offers a novel approach to bridge this gap by flagging potential TB cases, including those without symptoms, for further evaluation. This abstract presents the results from a community level TB screening using Ai-enabled X-ray in remote rural communities.
Intervention or response: Between January 2023 and December 2024, our TB REACH Wave 10 project implemented AI-enabled mobile chest X-ray screening in rural communities of Ebonyi and Nasarawa States, Nigeria. The screening followed a parallel algorithm: WHO symptom screening and AI-generated X-ray (QXR) scores. Individuals were classified as presumptive TB cases if they had TB symptoms or a QXR AI score ≥ 0.30. Sputum samples were collected for genexpert testing. All clients were encouraged to produce sputum samples, regardless of quantity.
Those unable to do so, or with negative GeneXpert results but flagged by AI, their X-ray films were sent to radiologist for further review.

Results/Impact: Of the 14,201 individuals screened, 1,553 were identified as presumptive TB cases; 213 were asymptomatic but flagged as TB presumptive by AI. Of these, 132 (62%) provided sputum samples, 4 tested positive via GeneXpert, and 12 more were clinically diagnosed after radiologist review—totaling 17 TB cases. Interestingly, 11 (64%) of the TB cases diagnosed were aged between 16–25.

Conclusions: These findings reveal that asymptomatic TB exists more among adolescents and young adults and may be missed without AI-assisted screening. This emphasizes the importance of enhancing TB screening approaches with advanced tools to detect early disease, particularly in younger, at-risk populations.

SOA11-627-20 Development of artificial intelligence lung sound algorithm using pulmonary physician-expert analysis to improve the accuracy of diagnosing paediatric pneumonia in low- and middle-income countries

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Background: Digital stethoscopes embedded with artificial intelligence (AI) can be powerful diagnostic tools for pneumonia, especially in low-resource settings where conventional stethoscope implementation has notable challenges. We aim to improve the diagnostic accuracy of these devices through novel use of real-time reference classifications by pediatric pulmonary physicians (experts) to train an AI algorithm.

Design/Methods: We are prospectively enrolling ≤10-year-olds at Tygerberg Hospital (South Africa) and Johns Hopkins Hospital (USA). We plan to enroll 400 children (1,600 total chest positions) with 100 children enrolled by experts (expert-subset). At enrollment, an expert auscultates using a conventional stethoscope (reference) and classifies lung sounds (normal, crackle (C), wheeze (W), or uninterpretable(U)) at two posterior and two anterior chest positions, while simultaneously recording with a digital stethoscope for 15 seconds. De-identified, unfiltered recordings are randomized to an expert listening panel for detailed breath-to-breath interpretations to generate overall chest position classifications. We assessed raw percentage agreement between real-time reference and panel classifications of enrolled participants.

Results: To date, we enrolled 133/400 (33%) study participants and recorded 698 chest positions. Among 47 expert-subset participants analyzed, the median age was 23 months (IQR 30), 25 (53%) were male, and 29 (61%) presented with respiratory illness. The panel interpreted 63 expert-subset chest position recordings with 45% agreement with the reference. Of 47 (75%) reference positions categorized as "normal", 23 (48%) were categorized as abnormal by the panel (Table).

By Conventional Stethoscope, n (Reference)	By Listening Panel Classification, n					
	Normal	C	W	CW	U	Total
No Adventitious Lung Sounds (Normal)	24	9	2	1	11	47 (75%)
Crackle (C)	2	1	0	0	0	3 (5%)
Wheeze (W)	4	2	1	0	1	8 (13%)
Crackle and Wheeze (CW)	2	0	1	2	0	5 (8%)
Uninterpretable (U)	0	0	0	0	0	0 (0%)
Total	32 (50%)	12 (19%)	4 (7%)	3 (5%)	12 (19%)	63
Agreement Between Reference and Listening Panel Classification (n = 63 total chest positions)						28 (45%)

Table. Expert-Subset Conventional Stethoscope (Reference) and Listening Panel Chest Position Level Classification (n = 63 total chest positions from 28 expert subset participants)

Conclusions: We developed an expert-annotated dataset utilizing simultaneous conventional stethoscope expert auscultation as the reference for AI algorithm training. Higher than anticipated misclassification of normal reference lung sounds as abnormal by the panel suggests digital stethoscope artifact and environmental noise are contributing to classification disagreement. To address this limitation, we are applying a noise-reduction filter to recordings before panel interpretation. This expert-annotated dataset will then train the AI algorithm before testing with non-expert recordings.

SOA11-628-20 Scaling up digital X-ray with CAD for TB screening: Implementation challenges, procurement, and regulatory insights from a market access analysis focused on sub-Saharan Africa

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Background: Digital chest X-ray with computer-aided detection (CAD) offers a promising tool for TB screening, especially in settings with limited access to human reads by radiologists. As part of the Unitaid-funded Start4All initiative, a regional assessment was conducted to better understand the logistical, infrastructural, regulatory, and workforce-related barriers to CAD implementation in sub-Saharan Africa.
Design/Methods: A market access assessment was conducted in seven sub-Saharan Africa countries, with in-depth analysis in Cameroon, Kenya, Malawi and Nigeria (Start4All countries), and lighter-touch assessments in Botswana, Côte d'Ivoire, and Zimbabwe. The study combined a literature review, structured stakeholder interviews, and internally validated questionnaires, focused on six core domains: human resources, system integration, product support, diagnostic performance, pricing and contracting, and regulation. Stakeholders included CAD suppliers, National TB Programmes, donors, regulatory agencies, and implementing partners.
Results: CAD uptake is growing in sub-Saharan Africa but remains highly donor-dependent. In Kenya, lack of regulatory guidance limits integration. Malawi faces internet and data governance challenges. Nigeria experiences high import costs and regulatory delays. Cameroon lacks procurement experience and technical capacity. Botswana has limited radiography workforce. Côte d'Ivoire faces unclear import procedures. Zimbabwe struggles with fragmented procurement and limited technical support. Common challenges include limited local support, unclear procurement pathways, insufficient training, and difficulties adapting CAD thresholds to local populations. A few CAD providers (mostly CAD4TB and Qure.ai) dominate the market, with varying pricing and interoperability. Regulatory oversight is minimal in most countries, with CAD systems typically introduced via donor-supported waivers.
Conclusions: To move CAD from pilot to national scale in sub-Saharan Africa, national TB programmes, government regulators, and procurement agencies need clear roadmaps, country-specific procurement strategies, and harmonised policies guided by existing evidence. Investment in local capacity, data governance, and infrastructure, alongside stronger coordination with donors and suppliers, is key to sustainable integration into TB care.

SOA11-629-20 Utilising AI-based risk stratification of TB recurrence for improving post-treatment outcomes

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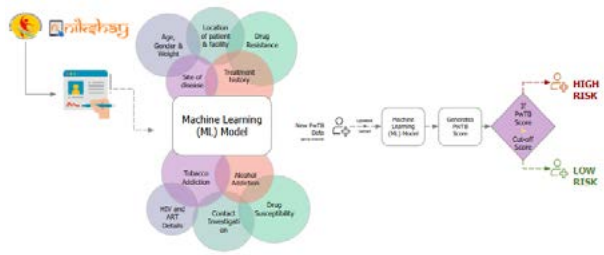
Background and challenges to implementation: Tuberculosis (TB) elimination is critically undermined by disease recurrence, which indirectly increases risk of drug resistance and disease transmission. In India, about 5-10% of individuals completing the treatment experience recurrence of TB. National Tuberculosis Elimination Programme (NTEP) mandates a post-treatment completion follow-up at 6-monthly intervals for two years. However, these follow-ups are marred due to several patient-related challenges.
Moreover, individuals with recurrent TB frequently face higher mortality and lower treatment completion rates. Thus highlighting a critical need to identify those at higher risk for timely interventions proactively.
Intervention or response: Wadhwani AI developed an innovative AI-powered tool to predict TB recurrence risk among individuals who have completed treatment. Us-

ing over 20 individual-level indicators for Persons with TB (PwTB) - such as health indicators, sociodemographic factors, comorbidities, and diagnostics from NTEP's case-based real-time surveillance digital platform, the Nikshay portal, the tool generates an individual risk score for all patients who have completed treatment for a TB episode. This score helps prioritise individuals most susceptible to recurrence within the first 24 months of treatment completion, allowing for targeted, intensive interventions alongside routine follow-ups.



Results/Impact: Internal evaluation was done using the dataset of more than 7.2 million PwTB notified on Nikshay portal who experience TB recurrence, splitting into training (5.3 million) and test (1.9 million) datasets. The evaluation demonstrated that by targeting the top 35% of high-risk individuals (ranked in descending order of risk score), the model correctly identified 60% of individuals diagnosed with recurrence of TB within the first 24 months of successful treatment completion. This compares favorably to the best rules-based baselines that achieve 43% sensitivity.

Conclusions: The AI tool shows promising results for effectively stratifying recurrence risk and prioritizing patients for enhanced post-treatment care. This tool could significantly aid NTEPs' follow-up strategies and contribute towards reducing the burden of recurrent TB in India.

SOA12 Making it work for us: Community-led programme design

SOA12-630-20 Campus Leaders Program: Fostering youth participation in TB elimination and SDGs implementation in Indonesia through a collaborative hexa-helix stakeholder engagement model

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Background and challenges to implementation: With a youth population of over 65 million aged 16–30, Indonesia holds significant potential in the fight against tuberculosis (TB). In response, the Bakrie Center Foundation launched the Campus Leaders Program (CLP), a youth-led initiative focusing on leadership, digital advocacy, education, and grassroots action. Implemented across 13 provinces — West Nusa Tenggara, North Sumatra, West Sumatra, Riau, South Sumatra, Lampung, Banten, DKI Jakarta, West Java, Central Java, East Java, the Special Region of Yogyakarta (DIY), and South Sulawesi — the program empowers young leaders to raise TB awareness and support prevention efforts at the community level.

Intervention or response: The implementation of the Campus Leaders Program is guided by the Hexa-Helix model—a collaborative framework that integrates six strategic sectors: government, academia, the private sector, media, civil society, and non-governmental organizations (NGOs).

Each stakeholder contributes distinct yet complementary roles, ranging from policy support and scientific expertise to financial resources, media outreach, community engagement, and field-level implementation. This multi-sectoral integration strengthens the program's effectiveness, scalability, and long-term sustainability in addressing TB at the grassroots level.

Results/Impact: The following are the outputs of the Campus Leaders Program from 2023 to 2024

General Output	Specific Output	Quantitative Data
Campus Leaders Program	The number of internship students during the 2023–2024 period	737 Students
	The number of individuals who participated in screening activities conducted by community health workers and internship students.	56,869 Individuals
	The number of individuals who received TB counseling and education provided by community health workers and internship students	39.498 Individuals
	The number of TB survivor patients/families who participated in empowerment activities organized by community health workers and internship students	472 Activities
	Capacity Building Activities for CLP Students	179 Activities

Conclusions: The Campus Leaders Program exemplifies how youth can serve as strategic actors in public health through inclusive, community-based approaches. By engaging students as trained advocates and facilitators, the program has contributed to reducing stigma, expanding public awareness, and strengthening cross-sector collaboration.
The Hexa-Helix model has proven essential in anchoring interventions at the local level while enabling scalability at the national level. More than just a series of activities, Campus Leaders Program cultivates long-term leadership, civic engagement, and a replicable model for advancing health equity in alignment with the Sustainable Development Goals (SDGs).

SOA12-631-20 From data to impact: Reducing TB stigma through digital community-led monitoring in Mozambique

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Background and challenges to implementation: Mozambique has a TB prevalence rate of 361 per 100,000 people. Although TB mortality has declined by 50% since 2015, late diagnosis and poor treatment adherence persist, driven by high HIV prevalence (12.5%), malnutrition, and stigma. Stigma, fuelled by myths and misconceptions, undermines timely care-seeking and contributes to preventable TB-related deaths. To address this, ADPP Mozambique implemented the OneImpact digital solution for Community-Led Monitoring (CLM), allowing people with TB (PWTB) to report barriers to care. Between 2022 and 2024, 20,828 people across Zambezia, Maputo, and Gaza provinces engaged with the platform. Stigma was the most reported barrier 38% (3,803 of 9,751 total barriers), with self-stigma at (40%), followed by family stigma (30%), community stigma (24%), workplace stigma (4%), and health facility stigma (2%). These insights guided targeted interventions to improve treatment initiation, adherence, and TB outcomes.
Intervention or response: OneImpact data revealed that 70% of stigma-related reports were linked to self-stigma and family stigma. In response, ADPP implemented targeted psychosocial support interventions for PWTB who reported self-stigma and engaged community leaders to address myths and misconceptions—aiming for increased confidence, safety, and support for PWTB and their families. These interventions were integrated into regular household visits across nine districts in 3 provinces.
Results/Impact: Community interventions informed by CLM data led to the resolution of 72% of reported stigma-related barriers. Resolution rates were highest for family stigma (82%) and community stigma (79%), with notable improvements in self-stigma (63%), supporting better treatment access and health outcomes.
Conclusions: The OneImpact CLM data revealed the magnitude of stigma—particularly self- and family stigma—as a serious barrier to TB control. This insight allowed community actors and health systems to prioritize resources in high-impact areas.
Integrating stigma-reduction efforts into household visits made interventions cost-effective, scalable, and sustainable, strengthening the overall TB response and the journey for people with TB.

SOA12-632-20 Leadership matters: Assessing TB stigma among industrial managers in Telangana's high-burden districts

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Background: TB-related stigma in workplaces negatively affects disclosure, timely testing, treatment adherence, and employee reintegration. Industrial managers influence workplace culture and policies, making their perceptions critical to effective TB response.
This study assessed TB stigma among key management of high TB risk industries like manufacturing, construction, and stone crushing personnel in Telangana's to guide workplace interventions aligned with national TB elimination goals.
Design/Methods: A cross-sectional study was conducted in four industrial districts—Sangareddy, Rangareddy, Medchal-Malkajgiri and Mahabubnagar. 102 purposefully sampled key management staff (human resource leads, factory managers, and health officers) participated in a structured interview adapted from the Stop TB Partnership Stigma Assessment Tool. Translated into Telugu, this and assessed personal attitudes, workplace norms, and policy awareness related to TB. A composite stigma score was generated from Likert scale responses and categorised as low (<15), medium (15–29), and high (≥30). Quantitative data were analysed using STATA.
Results: 17% of participants exhibited high stigma (≥30) and 42% medium stigma (15–29) towards people with TB. While willingness to hire TB survivors was high (95%), TB- training was available (90%) and TB-specific policies were largely in place (76%), 65% admitted that workplace culture discouraged disclosure of TB status.

Over half the participants associated TB with reduced productivity (51%) and reported task-related discrimination of people affected (53%). Other stigmatising attitudes included avoidance of food sharing (49%) and physical contact (47%).

Conclusions: Our findings reveal a range of contradictions and tensions in attitudes and practices towards people with TB, suggesting the need for multifaceted approach to stigma reduction that addresses underlying perceptions, translates awareness into changed behaviour, and holds industry leadership accountable for workplace responses to TB. Reducing stigma at the managerial level is particularly critical for fostering supportive work environments and advancing India's TB response.

SOA12-633-20 Beyond the narrative: Shifting power to communities in driving health research through community led-research strategy in Kenya

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Background and challenges to implementation: Traditionally, community engagement in health programs has focused on human stories and donor reporting, with limited involvement in generating evidence to inform programming. Community-led research shifts this dynamic by empowering communities to use their own knowledge and experiences to identify challenges and co-create solutions.

With support from the Global Fund, Amref implemented this initiative in partnership with key stakeholders to build community-led organizations' research capacity and promote evidence-based advocacy in Kenya.

Intervention or response: Between August 2022 and December 2024, an open call led to the submission of 67 research concepts from community organizations. Twenty-five (25) were selected, covering 11 out of 47 counties. They were supported with funding, mentorship, and capacity-building workshops on protocol development, data collection, analysis, and report writing. All studies obtained ethical approvals and used a range of research methodologies.

Results/Impact: Of the 25 studies, 23 were completed covering HIV (15), TB (3), malaria (3), governance (1), and COVID-19 (1), with 21 utilizing primary data. Ethical review revealed 16 protocols needed minor revisions and 7 major ones. On lung health, TB studies explored factors influencing treatment adherence, the role of community health promoters in reducing loss to follow-up, and barriers to treatment uptake, while the COVID-19 study analyzed community response mechanisms.

HIV-related studies investigated gaps and determinants affecting prevention, testing, and treatment among key and vulnerable populations, and the governance study examined youth public participation in health policy.

Disseminations have been conducted across all counties, and findings are informing implementation, with the Ministry of Health leading development of national guidelines to institutionalize community-led research.

Conclusions: This initiative marks a paradigm shift positioning communities not just as beneficiaries but as producers of knowledge.

National health systems should formally recognize and integrate community led research to ensure programs are evidence driven, inclusive, and responsive to the needs of the most affected populations.

SOA12-634-20 Building resilient TB interventions: Strengthening community-led monitoring through supervision and mentorship

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Background and challenges to implementation: Securing adequate funding for Tuberculosis (TB) interventions remains a persistent challenge, particularly in low- and middle-income countries like Nigeria. This funding gap threatens the global target of ending TB by 2030, as outlined in the WHO End TB Strategy. Nigeria, ranking among the top 10 high-TB-burden countries, contributes approximately 4.4% of global TB cases.

Despite these challenges, local resource mobilization remains limited, emphasizing the need to optimize available resources and enhance project efficiency. Supervision and mentoring have emerged as critical mechanisms for improving project implementation, accountability, and community ownership.

Intervention or response: The Challenge Facility for Civil Society (CFCS), a Stop TB Partnership initiative, has demonstrated success in several countries through structured supervision and mentoring frameworks. In Kano

State, Nigeria, two CFCS project cycles have prioritized Community-Led Monitoring (CLM) using innovative strategies, including:
- The OneImpact digital app for real-time tracking.
- Standardized monitoring checklists to ensure project quality.
- Strengthened grantee collaboration and structured mentoring across local, national, and international levels.
- A co-created work plan, mentorship schedule, and participatory data collection, supported by experts from public, private, and civil society sectors.

Results/Impact: Since 2022, the CFCS project in Kano has led to:
- A consistent and sustained increase in TB case notifications.
- Improved community engagement and advocacy.
- Increased participation of key community stakeholders (traditional leaders, religious groups, women and youth associations, teachers, and private healthcare providers) from less than 8% in 2017 to over 45% by 2024.

Conclusions: Amid dwindling donor funding and rising accountability demands, integrating supervision and mentoring into TB interventions is strategic and imperative. This approach optimizes resources, promotes trust and confidence of donors, builds local capacity, fosters innovation (especially in areas of local resource mobilisation), and ensures the sustainability of TB response efforts in Nigeria and other high-burden settings.

SOA12-635-20 Community-led monitoring using real-time data through OneImpact applications in Cambodia

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Background and challenges to implementation: Tuberculosis (TB) remains a pressing public health challenge in Cambodia, disproportionately affecting vulnerable and marginalized populations. Structural barriers such as financial instability, stigma, and limited access to healthcare continue to delay timely TB diagnosis and treatment. In response, the Challenge Facility for Civil Society (CFCS-R12) project, supported by the Stop TB Partnership, was launched in 2024 to shift the TB response to the community level, empowering affected populations to lead transformative change.

Intervention or response: The project focused on supporting Cambodia's national commitments under the UNHLM-TB declaration by strengthening leadership, accountability, and community ownership. A key intervention was the implementation of Community-Led Monitoring (CLM) through the OneImpactplatform across 17 operational districts. This tool enabled affected individuals to report TB-related issues and access support in real time. CFCS-R12 also prioritized gender-sensitive programming, empowered women and girls affected by TB, and conducted TB stigma assessments and size estimations of key and vulnerable populations across multiple provinces.

Results/Impact: The TBpeople Cambodia network was expanded to over 4,100 members across three provinces, becoming the frontline of the TB response. Through the OneImpact app, 6,972 users reported 206 TB-related issues, 189 of which were resolved through community coordination. More than 400 TB-affected individuals were linked to social protection services, including NSSF cards, Equity Fund cards, and poverty certification. Additionally, 1,797 at-risk individuals received materials on the prevention of sexual exploitation, abuse, and harassment (PSEAH), while a national communication strategy co-developed with the community strengthened outreach and advocacy.

Conclusions: CFCS-R12 tells a powerful story: "When communities are trusted, trained, and empowered, they do not just participate they lead." The project serves as a model for meaningful community engagement and has empowered affected individuals to take leadership in addressing persistent public health challenges in Cambodia, contributing to the national goal of ending TB by 2030.

SOA12-636-20 Community-led monitoring for TB: A human rights based approach using OneImpact

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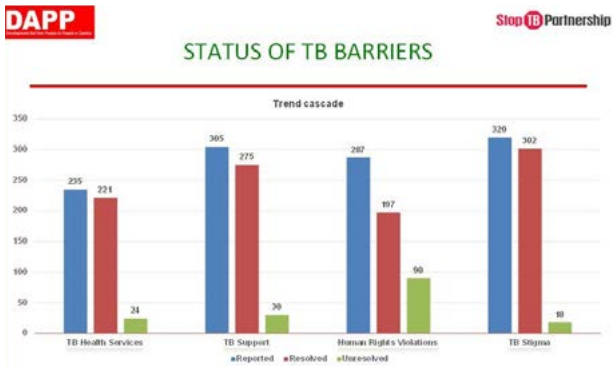
Background and challenges to implementation: In Zambia, a critical barrier to effective TB care is the lack of community engagement and real-time feedback from people with TB (PWTB) about their treatment experiences. In addition, service delivery challenges, such as long waiting times, medicine shortages, poor communication, and stigma, often hinder timely diagnosis and treatment adherence. These issues highlight the need for improved patient empowerment and stronger community accountability to enhance TB care and overcome these systemic barriers.

Intervention or response: DAPP Zambia (national NGO) implemented the OneImpact Community-Led Monitoring (CLM) platform from Stop TB Partnership in selected high-burden urban townships in Lusaka (evaluation areas). Individuals affected by TB reported service challenges in real time, accessed essential TB-related information, and engaged directly with Field Officers (FOs) and health providers. The OneImpact collected data from 867 respondents frequenting public health facilities (47% aged 18-25, 53% aged 26-35), with 35.51% male and 64.49% female.

Results/Impact:



Key issues reported include long waiting times **n=126** (10.94%), TB medicine shortages (18.14%), and poor communication with health workers **209** (24.74%), community stigma n=**285** (24.74%) and transport issues n=**247** (21.44%). Of the 1147 reported barriers, community TB stigma (n=320) was the highest reported category (Figure 1), with the overall resolution rate across all categories 86.8%.

OneImpact-enabled areas had faster issue resolution, improved communication, and better adherence to treatment than control sites. In-person interviews revealed unreported concerns, such as health worker rudeness, negligence, and lack of privacy during consultations.

First responders who are HF nurse quickly flagged issues to TB Treatment Supporters, who engaged the Person with TB (PWTB) and health facility staff, facilitated medication delivery, improved communication channels, and escalated unresolved cases.

These interventions hugely strengthened trust and improved service responsiveness.

Conclusions: OneImpact CLM app presents a scalable, rights-based model for improving TB service delivery and improve patient-centered care, recommending its adoption across Zambia National TB Control Program.

SOA12-637-20 415 youth-led actions in 2 months: A rapid movement to transform TB awareness and policy in Indonesia

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Background and challenges to implementation: Tuberculosis (TB) remains a complex and persistent challenge in Indonesia, characterized by limited public awareness, inadequate social protection, and insufficient political commitment—as evidenced by the omission of TB from the revised Health Law.

Furthermore, youth engagement in the TB response considered minimal. This is a missed opportunity, as young people bring unique strengths to public health efforts, including digital fluency, creativity, and strong grassroots connections. Indonesia, with a large youth population, empowering youth as agents of change is a strategic investment to accelerate TB elimination.

Intervention or response: Stop TB Partnership Indonesia (STPI) launched the Caraka TB Institute, a youth-led initiative positioning young as central actors in TB education, campaigning, and advocacy. Twenty youth from 19 cities were selected and trained to design and implement context-specific awareness and advocacy campaigns. Selection prioritized youth that already active in local movements, with strong community ties and social media reach, ensuring their efforts were embedded within broader youth networks.

Implementation followed a structured model, including mini-surveys to gauge public understanding of TB, social media campaigns and production of a documentary film to boost awareness, and community-based actions engaging policymakers, influencers, and local residents.

See more: *Caraka TB Institute Video*

Results/Impact: In just two months, this movement carried out 415 advocacy actions, generated 98 media coverages, and sparked 1.8 million social media interactions on TB. Over 9,500 youth were mobilized at the grassroots level. Their efforts prompted several local governments to commit regional budgets for TB programs and contributed to TB being formally recognized as a national development priority.

See more: *Caraka TB Magazine*

Conclusions: This initiative demonstrates that youth engagement is not only feasible but transformative. Youth-led, community-rooted strategies can revitalize national conversations on TB, reduce stigma, and influence policy. Youth movements offer a powerful, scalable model to accelerate progress toward TB elimination in Indonesia.

SOA12-638-20 Empowerment of local self-governing bodies to accelerate TB elimination efforts in Kashmir, India

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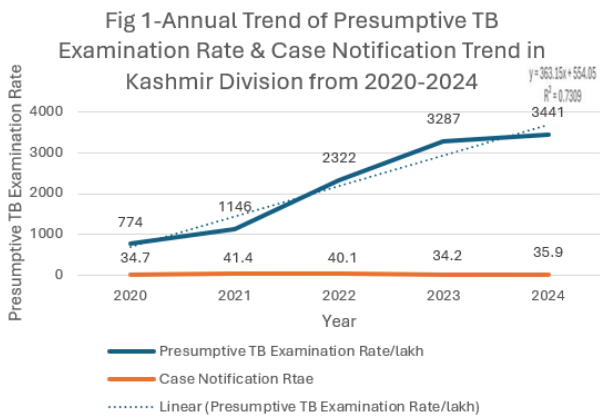
Background and challenges to implementation: Panchayati Raj Institutions (PRIs) are rural local elected bodies in India that promote community-led, participatory governance for decision-making in rural areas. In the PRI system, Gram Panchayats (GPs) serve as the governing bodies for each village, overseeing health and development activities. The Kashmir Division undertook the 'Healthy Villages' initiative in 2023 to support Panchayats in meeting the predefined criteria for achieving TB-Free status.

This study aims to assess the impact of this TB Mukt Gram Panchayat initiative on TB program outcomes at the grassroots level in Kashmir, India.

Intervention or response: Since 2024, Jan Aarogya Samiti and Village Health, Sanitation, and Nutrition Committee meetings were held across all GPs, engaging TB survivors, health officials, and PRI members. These meetings shaped the Gram Panchayat Development Plan to monitor and strengthen TB efforts at the grassroots.

Program success was evaluated using six indicators: presumptive TB testing, TB notifications, drug susceptibility testing, social welfare uptake, community nutrition support, and treatment outcomes. The same parameters defined TB-Free GP status. Data was analyzed using SPSS ver. 22 .



Results/Impact: As part of this initiative, PRI representatives across 2,182 GPs were trained and sensitized to strengthen grassroots-level TB response. Notably, 62% of these GPs prioritized the inclusion of TB-affected individuals in welfare programs and related activities, reflecting strong community engagement.

The presumptive TB testing rate in 2024 reached 3,441 per 100,000 population—well above the national average of 1,281 per 100,000,and represented a 344% increase from the 2020 baseline in the state (Fig-1). As a result of these collective efforts, 1,414 GPs successfully met the defined six criteria and were declared TB-Free GPs.

Conclusions: Engaging local self-governing institutions enhances TB elimination efforts by decentralized decision-making, active community participation, and strong sense of ownership, outcomes clearly demonstrated in this initiative. Such approaches warrant greater emphasis in national policy frameworks, especially for hard-to-reach regions.

SOA12-639-20 Using design thinking to translate evidence into strategy: A case study on strengthening community health workers in TB prevention and care in Madagascar

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Background: In Madagascar,community health workers (CHWs) are essential for healthcare access, but only one in five engages in TB response .In 2024, we launched a multisectoral initiative aimed at enhancing CHW engagement in TB and HIV through evidence, strategy design, and evaluation. This abstract presents a case study of how scientific evidence informed the strategy design within this initiative.

Design/Methods: We conducted a three-day, in-person design-thinking workshop with 37 stakeholders, including public health officials (n=19), NGO representatives (n=9), healthcare providers (n=4), and CHWs (n=5). The workshop presented findings from a mixed-methods study on CHW characteristics, conditions, engagement, and motivation across four regions in Madagascar, along with best practices from countries that have strengthened CHW programs. Guided by structured phases of empathy, ideation, and elaboration, participants prioritized challenges and co-developed context-specific, evidence-based solutions-placing CHWs at the centre of the process. Sessions featured presentations, personal testimonials, open plenary discussions, and group work with preformed composition to ensure diverse perspectives and

rich dialogue. For each challenge, participants proposed and refined solutions through iterative discussion and dot voting. Plenary debates helped build consensus on strategic priorities to enhance community-based TB prevention and care.

Results: Seven essential strategy components to strengthen CHW engagement were identified and elaborated in detail, including measures on (1) financial protection, (2) recognition and social support, (3) provision of equipment and materials, (4) training, (5) supervision, (6) security, and (7) improved coordination. The originality and interactivity of the workshop were widely appreciated, with participants emphasizing CHWs' active involvement and calling for even greater representation in future events.

Conclusions: This case study illustrates how design thinking can translate research into public health strategies. The developed strategy will be implemented in a pilot zone, with implementation research guiding its impact evaluation and informing organisational and national policies to sustainably strengthen CHWs' engagement in TB prevention and care.

SOA12-640-20 Uncovering drivers of multi-drug-resistant TB/HIV treatment adherence using natural language processing of routine counselling notes

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Background: Although multidrug-resistant tuberculosis (MDR-TB) treatment has advanced, adherence remains suboptimal, especially with HIV co-infection. Identifying context-specific strategies to promote adherence is especially challenging in limited-resource settings. We employed novel machine-learning/AI derived methods to identify latent factors related to treatment adherence and inform intervention approaches.

Design/Methods: We analyzed 327 unstructured counseling notes from a prospective study of MDR-TB HIV treatment in KwaZulu-Natal, South Africa using natural language processing (NLP). Preprocessing steps included data preparation, stemming, and tokenization to retain common co-occurrences. We applied BERTopic to identify latent topics influencing adherence by: (1) embedding—transforming texts into numerical representations—with pre-trained Sentence-Transformer model; (2) dimension reduction to simplify embeddings; (3) density-based unsupervised clustering; and (4) keyword extraction to identify keywords that are both frequent within and unique to each cluster. To address data sparsity and validate topic quality, we performed semantic search using a custom corpus built from BERTopic outputs. K-Means clustering was applied to sentence embeddings and semantic search results to evaluate semantic coherence and topic interpretability. We employed human-in-the-loop supervision for results interpretation.

Results: BERTopic generated 20 candidate topics. We selected the six most coherent/representative topics, ranked by number of associated notes ("count"). Noninformative keywords were removed, and topic definitions refined by human-in-the-loop review. Six-group clustering embeddings yielded a C_v coherence—human interpretability score—of 0.671, suggesting that the embeddings captured meaningful semantic variation. Clustering based on semantic search results further improved coherence (C_v = 0.715).

Topics	Keywords	Example from Counseling Notes	Count
Support experiences	home, family, child, grant, partner, support, stay, currently, time, work	"The participant is happy to be at home. They said their family is very supportive; as a result, they were accompanied by their sister, who is their treatment supporter."	42
Medication side effects	vomit, feel, effect, weak, physically, nausea, better, family	"The participant is physically weak. They said that for the past three weeks, they have had vomiting troubles."	29
Impacts of traditional medicines, alcohol and substance use	adherence, substance, use, alcohol, effect, traditional medicine, study	"They want to understand from the nurse regarding the effects of alcohol and traditional medicine, which they view as hindrances to adherence."	25
Barriers to clinic visit attendance	clinic, covid, test, keep clinic appointment, prescribe, importance	"They missed their clinic visit last week because they went home due to the lockdown caused by COVID-19."	16
Barriers to care due to rural residence	device, intake, rural area, problem, poor network, reside, home	"The patient said they did not face any challenges with the devices other than network issues, as they reside in a rural area."	15
Barriers to accessing social grants	grant, sassa, application, letter, disability grant, clinician, adherence	"What is stressing them the most is that they can't apply for a grant because they can't get a letter from the department of labor to prove that they are not working."	14

Note: Keywords are ordered by c-TF-IDF scores and manually screened for interpretability. Low-utility words are put to the end. Pronouns were de-gendered.

Table 1. Top 6 topics generated by BERTopic

Conclusions: Using NLP, we identified topics with high C_v coherence scores derived from embeddings and semantic search clustering, indicating that NLP-extracted topics capture meaningful semantic structures. These topics highlighted common treatment experiences and adherence barriers faced by patients. Incorporating human-in-the-loop supervision further refined keywords within

topic clusters. NLP-assisted analysis of data from routine medical records presents an opportunity to support targeted intervention development.

SOA12-641-20 General and religious coping among people with TB: A systematic enquiry using Brief COPE and Brief RCOPE scales

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Background: Studies have explored general and religious coping using standardized coping scales in ailments like sickle cell anemia to cancer however, literature on coping using coping scales among people with tuberculosis (PWTB) is limited and restricted to financial coping or qualitative enquires. This study explores coping strategies using coping scales among PWTB.

Design/Methods: 30 adults (≥18 years) with drug-sensitive pulmonary tuberculosis (TB) from public TB clinics in Pune, India were administered Centre for Epidemiologic Studies-Depression (CES-D) (20-item), General Anxiety Disorder-7 (GAD-7), Brief Coping Orientation to Problems Experienced (Brief COPE) (28-item) and Brief Religious Coping Scale (Brief RCOPE) (14-item) scales at treatment initiation. Coping scores were summarized using heatmaps, and descriptive statistics were used to compare these scores among PWTB with depression and/or anxiety symptoms versus those without.

Results: Of 30 participants, 13 (43%) reported depression symptoms (DS) and 14 (47%) reported anxiety symptoms (AS) whereas 17 (57%) reported DS and/or AS symptoms. Higher scores indicate more use. Problem-focused coping (higher score indicative of a practical approach to problem-solving) and emotional-focused coping (higher score indicative of regulating emotions associated with stressful situations) were used more whereas avoidant coping (lower score indicative of adaptive coping) was used less by all participants.

However, participants with DS and/or AS (p=0.02), used more avoidant coping compared to those without DS or AS.

Additionally, these participants reported using more denial (p=0.012) and behavioral disengagement (p=0.005) compared to those without DS and/or AS. Positive religious coping (mean18.5, SD5.7) was used more, and negative religious coping (mean10.8, SD4.0) was used less by PWTB but no significant difference between those with DS and/or AS and without (Figure).

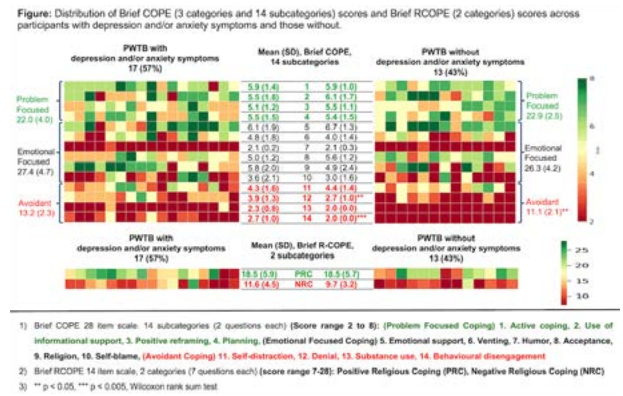

Figure: Distribution of Brief COPE (3 categories and 14 subcategories) scores and Brief RCOPE (2 categories) scores across participants with depression and/or anxiety symptoms and those without.

1) Brief COPE 28 item scale. 14 subcategories (2 questions each) **(Score range 2 to 8): (Problem Focused Coping) 1. Active coping, 2. Use of informational support, 3. Positive reframing, 4. Planning, (Emotional Focused Coping) 5. Emotional support, 6. Venting, 7. Humor, 8. Acceptance, 9. Religion, 10. Self-blame, (Avoidant Coping) 11. Self-distraction, 12. Denial, 13. Substance use, 14. Behavioural disengagement**

2) Brief RCOPE 14 item scale, 2 categories (7 questions each) **(score range 7-28): Positive Religious Coping (PRC), Negative Religious Coping (NRC)**

3) ** p < 0.05, *** p < 0.005, Wilcoxon rank sum test

Conclusions: As coping contributes to better health outcomes, TB programs should develop strategies to strengthen coping among PWTB with an additional focus on reducing avoidant coping use and PWTB with depression and/or anxiety symptoms.

SOA13 Feeding recovery, fueling hope: Nutrition's central role in TB elimination

SOA13-642-20 Body mass index and TB risk: An updated systematic literature review and dose-response meta-analysis

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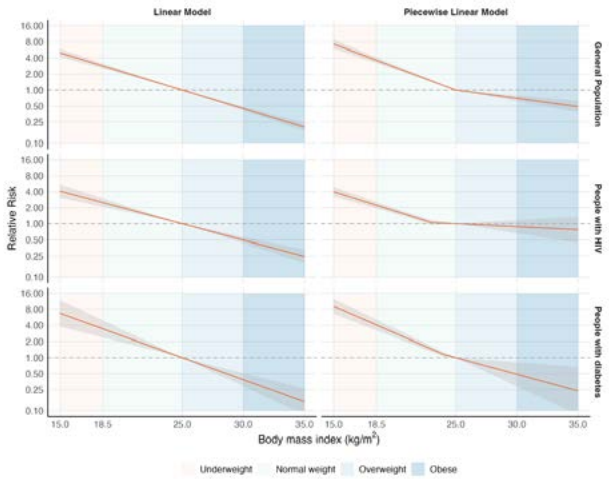
Background: The relationship between nutritional status and tuberculosis is critically important but poorly understood. We extended a 2009 review characterising the relationship between body mass index (BMI) and tuberculosis risk.
Design/Methods: We systematically searched for new studies published between 2009-2024 investigating BMI and tuberculosis risk in adults. We extracted estimates of risk in BMI categories, used resampling to assign a median BMI "dose" within each category, and included these in one-stage dose-response meta-analyses, stratifying results by population group and country tuberculosis burden. We fitted linear models for comparability with the 2009 review, and refined analysis with restricted cubic spline models to investigate non-linear relationships, and piecewise linear models.
Results: We included 43 cohorts – 37 from our searches and six from the previous review. Our analyses showed an inverse, dose-response relationship between BMI and tuberculosis risk across all populations in the full underweight to obese range (15.0-35.0kg/m^2). In the linear models, the reduction in tuberculosis risk per unit increase in BMI was 14.8% (95%CI: 13.3-16.3) in 22 general population cohorts (n=24,921,531); 13.1% (95%CI: 10.6-15.6) in 18 cohorts of people with HIV (n=162,069), and 17.4% (95%CI: 12.5-21.9) in three cohorts of people with diabetes (n=1,118,424) (Figure). The spline and piecewise linear models showed a non-linear relationship – in the general population there was a more steep per-unit reduction in risk for BMI<25.0kg/m^2 (18.0%, 95%CI: 16.4-19.6), which a more gradual reduction for BMI≥25.0kg/m^2 (6.9%, 95%CI 4.6-9.2) (Figure). Based on the global BMI distribution, we estimated an overall relative risk of tuberculosis associated with undernutrition (BMI<18.5kg/m^2 versus BMII≥18.5kg/m^2) of 5.1 (95%CI: 4.3-6.0).



Conclusions: Our results highlight the independent importance of nutritional status as a driver of the global tuberculosis epidemic. Social protection and other interventions to improve nutrition should be urgently scaled up as part of a holistic global tuberculosis response.

SOA13-643-20 Diagnostic accuracy of molecular testing on different respiratory specimens for TB diagnosis in children hospitalised with severe acute malnutrition

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Background: Childhood tuberculosis (TB) diagnosis challenges are worsened in case of severe acute malnutrition (SAM). We sought to assess the performance of XpertMTB/RIF Ultra(Ultra) assays on stools, Nasopharyngeal Aspirate (NPA) and Gastric Aspirate (GA) for TB diagnosis in children with SAM.
Design/Methods: In the TB-Speed SAM study, children < 5years hospitalized with SAM in 3 tertiary hospitals in Zambia and Uganda were systematically investigated for TB using culture on two GAs, Ultra on 1 GA, 1 NPA and 1 stool sample, clinical examination, chest X-ray abdominal ultra-sound, and followed-up for 6months. We assessed

yield and diagnostic accuracy of Ultra on microbiological samples compared to a Microbiological Reference Standard (MRS) based on 2 GA culture results and NIH-classification-based Composite Reference Standard (CRS).

Results: Of 603 children enrolled - median age 1.2 [IQR 0.9, 1.7]years, 65 (11%) HIV-infected, 16 (2.6%) had culture-confirmed TB, and 51 (8.5%), 57 (9.5%) and 495 (82.0%) were classified as confirmed (culture or Ultra), unconfirmed and unlikely, respectively. Ultra detection yield was 8/603 (1.3%) for NPA, 13/603 (2.2%) for stools and 39/603 (6.5%) for GA.

The sensitivity and specificity of Ultra testing against MRS was 33.3% (95%CI: 11.8 – 61.6) and 99.2 (97.7 - 99.8) for NPA, 56.2 (29.9 - 80.2) and 98.9 (97.2 - 99.7) for stools, and 56.2 (29.9 - 80.2) and 95.8 (93.3 - 97.6) for GA, respectively.

Of 16 children with culture-negative Ultra-positive GA, 11(68.7%) had trace or very low positive Ultra. Combining stool to NPA increased sensitivity to 56.2% but did not improve sensitivity compared to stool alone.

Samples	MRS				CRS			
	n/N	Sensitivity % (CI)	n/N	Specificity % (CI)	n/N	Sensitivity % (CI)	n/N	Specificity % (CI)
NPA	5/15	33.3 (11.8 - 61.6)	372/375	99.2 (97.7 - 99.8)	8/97	8.2 (3.6 - 15.6)	470/470	100 (99.2 - 100)
Stool	9/16	56.2 (29.9 – 80.2)	360/364	98.9 (97.2 - 99.7)	13/102	12.7 (7.0 - 20.8)	452/452	100 (99.2 - 100)
GA	9/16	56.2 (29.9 - 80.2)	366/382	95.8 (93.3 - 97.6)	39/107	36.4 (27.4 - 46.3)	470/470	100 (99.2 - 100)
Combined								
NPA/ Stool	9/16	56.2 (29.9 - 80.2)	381/387	98.4 (96.7 - 99.4)	15/107	14.0 (8.1 - 22.1)	486/486	100 (99.2 - 100)
NPA/GA	9/16	56.2 (29.9 - 80.2)	370/387	95.6 (93.1 - 97.4)	40/108	37.0 (27.9 - 46.9)	481/481	100 (99.2 - 100)
Stool/GA	10/16	62.5 (35.4 - 84.8)	368/387	95.1 (92.4 - 97.0)	43/108	39.8 (30.5 - 49.7)	487/487	100 (99.2 - 100)
NPA/ Stool/GA	10/16	62.5 (35.4 - 84.8)	368/387	95.1 (92.4 - 97.0)	43/108	39.8 (30.5 - 49.7)	487/487	100 (99.2 - 100)

Table1: TB diagnosis on respiratory samples against MRS and CRS.

Conclusions: GA had the highest detection yield despite the low bacterial load characteristic of pediatric patients' samples, explaining the limited sensitivity. Stool has higher sensitivity than NPA with limited advantage of adding NPA to stool in children hospitalized with SAM.

SOA13-644-20 Can we diagnose TB better in nutrition centres? Experience from Maiduguri Nigeria

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Background and challenges to implementation: In 2022, WHO introduced treatment decision algorithms (TDAs) to enhance diagnosis and treatment of TB in children. These TDAs were implemented in the inpatient therapeutic feeding center for severely malnourished children supported by Medecins Sans Frontières (MSF), in Maiduguri, Nigeria in June 2023.

Challenges faced in implementation include increased trainings needs, follow-up of the algorithm use, increased human resource needs for follow-up, limited TB medications, and inadequate access to quality chest X-ray.

Intervention or response: Staff training and tools to track outcomes were provided. A focal person was appointed to ensure mentoring and instant feedback to staff. TB medication supply was strengthened in collaboration with the Ministry of Health. Partnerships enhanced access to quality chest X-rays.

Results/Impact: Algorithm use significantly increased TB detection. Proportion of admitted children started on TB treatment increased following algorithm implementation (Figure 1).

However, a reduction in algorithm use and subsequently TB treatments started were observed when less resources were dedicated to support the implementation. To address these decreases, a focal person was appointed to follow TDA usage and mentor clinicians, potentially contributing to a subsequent rebound in the proportion of children initiated on TB treatment.

However, fluctuations over time in the proportions of children started on TB treatment might also be related to the seasonal variations in the number of admissions and the associated workload. Clinicians report improved di-

agnostic capacity and confidence. MSF along with the National TB Program is supporting other centers in adopting the algorithm through training and technical assistance.

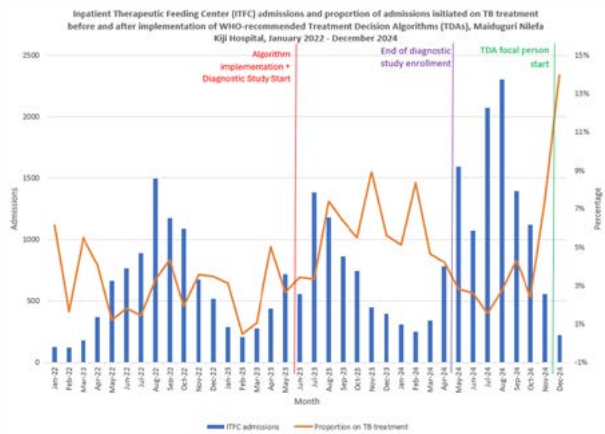

Figure 1.

Conclusions: Integrating the TDAs in a nutritional program has improved TB treatment initiation in malnourished children. Key factors for success included training, resource availability, follow-up of activities, and adaptive strategies.

Future efforts should focus on sustaining progress and ensuring medication supply to enhance TB case care in resource-limited settings and nutrition projects.

SOA13-645-20 Weighing the risk: Severe acute malnutrition determinants in children treated for TB in Papua New Guinea

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Background: Tuberculosis (TB) remains a major public health issue in Papua New Guinea (PNG), particularly among children. Nutritional status is a critical determinant of TB outcomes, yet limited data exist on the drivers of severe acute malnutrition (SAM) in this context. This study describes the clinical and nutritional profile of children treated for TB at Port Moresby General Hospital (PMGH), using mid-upper arm circumference (MUAC) as an indicator of nutritional status.

Design/Methods: We conducted a retrospective analysis of children treated for TB at PMGH from 2016 to 2024. Data included demographics, HIV status, age, bacteriological confirmation, and MUAC. Nutritional status was classified using WHO MUAC thresholds for children under 5, and age-specific MUAC cutoffs for children aged 5–19 years based on reference data from Mramba et al. (2017). Multivariate logistic regression was used to identify predictors of SAM.

Results: A total of 1,162 children with complete data (including MUAC measurement, HIV status, age, and gender) were included in the analysis. Of these, 42% were female, and 2.9% were living with HIV. Xpert testing was performed in 624 children (54%), with 167 (27%) having bacteriologically confirmed TB. Most children (82.5%) were between 6 months and 9 years of age. Nutritional assessments showed that 37.4% had a normal MUAC, 35.5% had moderate malnutrition, and 27.0% were classified with severe acute malnutrition (SAM).

Adolescents (≥10 years) (OR = 2.42; 95% CI: 1.75–3.33) and children living with HIV (OR = 3.39; 95% CI: 1.69–6.88) had significantly higher odds of SAM. Notably, SAM was not associated with increased mortality in this cohort.

Conclusions: SAM is common among children treated for TB at PMGH, particularly in adolescents and those living with HIV. Integrated TB, HIV, and nutritional services are needed to improve pediatric TB outcomes in PNG.

SOA13-646-20 Skip the snakes, ladder up: Let the game do the counselling

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Background and challenges to implementation: Good nutrition and healthy habits are vital during TB treatment—not just for people with TB (PwTB) but also for their families. They support treatment adherence, recovery, and prevention. Effective counselling is essential to promote these behaviours. However, traditional counselling methods face programmatic challenges, such as limited human resources, inadequate skills, and a lack of engaging tools to deliver impactful counselling resulting in poorer adherence.

Intervention or response: The Union and the Telangana State collaborated with the Department of Food and Nutrition, Mahila University, Hyderabad, to develop a Snakes and Ladders-based counselling tool. Professors

and students designed the game by scientifically mapping the nutritional value of healthy foods and the risks of unhealthy habits, using locally available, affordable items. The pictorial gameboard, accompanied by dice and instructions, was distributed to trained frontline workers. Instead of pawns, families used household items like peanuts, cashew, garlic etc. as tokens. Frontline workers facilitated the game by engaging the PwTB and their families, guiding discussions based on game progress. In 2024, 1,500 boards supported over 53,600 counselling sessions across the field.

Results/Impact: In-depth interviews were conducted with medical practitioners (n=7), persons with TB (PwTB) (n=8), family members (n=12), and frontline health workers (n=6). The findings revealed:

Medical Practitioners:

Found the game simplified complex health information, making counselling more efficient and engaging.

Frontline Health Workers:

Reported increased interaction and enthusiasm during sessions. The game sparked conversations and helped reinforce messages about balanced diets and healthy habits.

PwTB and Family Members:

Shared that the game helped them identify affordable, nutritious food options and avoid unhealthy practices. Many reported prioritizing better nutrition, regular exercise, and incorporating indigenous practices like yoga into their routines.

Conclusions: Counselling sessions assisted with the game brought lot of laughs along with the reported behavioral changes which contributed to the treatment adherence and adopted healthy habits.

SOA13-647-20 Enhancing TB treatment outcomes: The role of nutrition education and micronutrient supplementation on immunological markers and quality of life in peri-urban Bangladesh

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Background: Enhancing Tuberculosis Treatment Outcomes: The Role of Nutrition Education and Micronutrient Supplementation on Immunological Markers and Quality of Life in Peri-Urban Bangladesh.

Design/Methods: Malnutrition and tuberculosis (TB) are closely linked, with undernutrition increasing the risk of TB, while TB exacerbates malnutrition.

This study aimed to evaluate the impact of nutrition education and micronutrient supplementation (Zinc and Vitamin A) on biochemical, immunological markers, and the quality of life (QoL) in pulmonary TB patients receiving DOTS in the peri-urban areas of Bangladesh.

A prospective longitudinal intervention study was conducted involving 216 adult, newly diagnosed sputum-positive TB patients, randomly allocated into three groups: Group A (DOTS only), Group B (DOTS + nutrition education), and Group C (DOTS + nutrition education + micronutrient supplementation). The study assessed nutritional status, biochemical markers (serum Zinc, retinol, leptin), sputum conversion time, and QoL using the SF-36 questionnaire at baseline, 2 months, and 6 months.

Results: Results showed significant improvements in nutritional indicators such as weight and BMI in all groups, with the greatest increase in Group B (16.5%). Group C, which received both micronutrient supplementation and nutrition education, demonstrated the highest increase in serum Zinc (0.85 mcg/mL) and retinol (31.4 mcg/dL) levels. Serum leptin levels, indicative of fat stores, increased in all groups. Although sputum conversion time was shortest in Group B, the overall QoL improved in all groups, reflecting enhanced physical and mental health.

Conclusions: This study highlights that while micronutrient supplementation and nutrition education may not lead to significant outcomes in all parameters, they positively impact the nutritional status, immune function, and QoL of TB patients. Raising awareness about nutrition and integrating it into TB treatment strategies could play a vital role in improving health outcomes and controlling TB in resource-poor settings.

SOA13-648-20 Community-driven nutrition support model to enhance TB outcomes: Insights from Uttarakhand, India

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Background and challenges to implementation: Recognizing the strong link between undernutrition and adverse TB outcomes, Uttarakhand, a remote mountainous state in India, launched a community-based nutrition kit distribution initiative for people with TB.
This mixed-method study evaluates the effectiveness of this community-driven model versus the conventional health-center-based distribution approach in improving TB treatment outcomes, aiming to assess its impact on treatment adherence, recovery rates, and overall patient well-being.
Intervention or response: In the community-driven model, nutrition kits were sourced from corporate donors, Non-Governmental Organisations (NGO), and individuals and distributed at beneficiaries' homes by TB survivors in contrast with the previous approach where persons with TB collected nutrition kits from health centers. The study analysed treatment outcomes for both groups, notified in 2023, using data from Ni-kshay, India's digital TB surveillance platform. Interviews were conducted with donors, health providers, TB survivors and beneficiaries using an inductive narrative approach to gather insights into the impact of this initiative.

Nutrition Kits Disbursement Approaches	Total Beneficiaries	Favourable outcome rate %	Lost to Follow up rate %	Death rate %
1. Previous Approach				
Persons with TB, who got benefits from Donors directly at health centres	424	88.47	2.82	1.4
2. Community driven approach				
Persons with TB who got benefits at their homes facilitated by TB survivors	1013	92.89	0.79	0.29
X^2 (p value)		0.0115		
Fisher Exact Test (p value)			0.005	0.0229

Table 1: TB treatment outcomes among persons receiving nutrition kits through community driven approach as compared to those receiving nutrition kits at health centers in Uttarakhand, India.

Results/Impact: The study cohort consisted of 1,438 persons with TB (mean age 46 years, 58% male). Of these, 1,013 (70.5%) received kits at home through the community-driven model, while 425 collected their nutrition-kits at health centers. Both groups were similar in sociodemographic characteristics.
The community-based group demonstrated a higher treatment success rate (92.9%) compared to the health-center group (p=0.0115). The former group had 3 deaths and 8 lost to follow-up (LTFU), while the latter had 6 deaths (p=0.0229) and 12 LTFU (p=0.005). Stakeholder interviews revealed satisfaction with streamlined procedures, reduced out-of-pocket costs, improved treatment adherence, and enhanced social inclusion for those receiving home-delivered kits.
Conclusions: The community-based model, facilitated by TB survivors, significantly improved TB treatment outcomes compared to traditional methods. These findings underscore the potential for scaling up such models and integrating corporate, NGO partnerships and engagement of TB survivors, to enhance TB care and achieve TB Elimination goals.

SOA13-649-20 Impact of nutritional support to the person with TB: A comparative study between Nikshay Poshan Yojna and Nikshay Mitra initiative in West Bengal, India

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Background: Tuberculosis (TB) and nutrition have a bi-directional relationship: undernutrition increases the risk of developing TB, and TB can worsen nutritional status, leading to a vicious cycle. The Nikshay Poshan Yojana (NPY) is a Direct Benefit Transfer (DBT) scheme under the National Tuberculosis Elimination Programme (NTEP) in India, launched on 1st April 2018, for nutritional support to the person with TB (PwTB) during their treatment.
The "Pradhan Mantri TB Mukt Bharat Abhiyaan" (PMTBMBA), launched on September 9, 2022, aims to eliminate tuberculosis through community involvement, including the "Nikshay Mitra" initiative, which encourages donor to support TB patients with nutritional, diagnostic, and vocational assistance.
The study aimed to measure the comparative impact of the nutritional support schemes in terms of favourable treatment outcomes.

Design/Methods: This is an observational study. A secondary analysis done on data extracted from the Ni-kshay portal which is the web-based case-based TB surveillance system of India.

Results: 86.9% PwTB received any types of benefits. 75.9% received only NPY , 0.9% received only food basket (NM support), 10.1% participants received both NPY & NM support and 13.1% received none of these two.

Treatment success of the PwTB who received both the benefits vs who received none was 96% vs 66.6%. Lost to follow up rate among PwTB who received both the benefits and who received none was 0.7% and 5.8% respectively. Death rate among these groups was 2.9% & 7.1% respectively (*Fig-1*)

Fig 1: Proportion of different treatment outcomes and correlation with the support of Nikshay Poshan Yojna (NPY) & Nikshay Mitra (NM) in West Bengal in 2024. N=63186, n1= 8271, n2= 47972, n3=581, n4=6362; [N=n1+n2+n3+n4]

Treatment Outcomes		Total N (%*)	No nutritional support n1(%*)	Only NPY (Cash) n2(%*)	Only NM (Food basket) n3(%*)	Both the NPY & NM n4(%*)	p-value
Treatment success	Yes (Cured/Treatment completed)	55,200 (87.4)	5,512 (66.8)	43,091 (89.8)	492 (84.7)	6105 (96.0)	0.000
	No (Unfavourable outcomes)	7,986 (12.6)	2,759 (33.4)	4,881 (10.2)	89 (15.3)	257 (4.0)	
Loss to Follow-up	Yes	1, 379(2.2)	482 (5.8)	843 (1.8)	12 (2.1)	42 (0.7)	0.000
	No	61,807 (97.8)	7,789 (94.2)	47,129 (98.2)	569 (97.9)	6,320 (99.3)	
Treatment failure	Yes	363 (0.6)	48 (0.6)	286 (0.6)	5 (0.9)	24 (0.4)	0.135
	No	62,823 (99.4)	8,223 (99.4)	47,686 (99.4)	576 (99.1)	6,338 (99.6)	
Death	PwTB died before treatment completion	4,459 (7.1)	1,651 (20.0)	2,553 (5.3)	68 (11.7)	187 (2.9)	0.000
	Not died	58,727 (92.9)	6,620 (80.0)	45,419 (94.7)	513 (88.3)	6,175 (97.1)	

Notes: * column percentage (within the category); Proportions & p-Value calculated with Chi square test.

Conclusions: A good proportion of PwTB in West Bengal is receiving the nutritional supports under NPY-DBT or PMTBMBA or through both the schemes. The schemes are impactful in terms of significantly increasing treatment success rate & significantly decreasing LTFU & Death rate. NPY-DBT scheme seems to be more impactful in terms of better coverage, association with higher treatment success rate & lower LTFU & Death rate.

SOA13-650-20
How best to manage TB in households? A modelling analysis of TB preventive therapy and nutritional support in India

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Background: Tuberculosis preventive therapy (TPT) is a key strategy for TB prevention, but real-world completion rates consistently fall short of expectations. Emerging evidence suggests that nutritional support can reduce TB incidence among household contacts and improve treatment outcomes. Using a mathematical model, we compared the impact and cost-effectiveness of TPT versus nutritional support in India.

Design/Methods: We built a dynamical model for household cohorts of TB index cases and their contacts. The model incorporated programmatic data for TPT completion rates and subsequent TB incidence. We also used estimated rates of side effects and drug resistance risks from the literature. For nutritional support, we included published estimates of its effect on TB incidence and outcomes. Also incorporating programmatic costs, we estimated incremental cost-effectiveness ratios (ICERs) of two interventions, TB treatment for the index case plus: (i) TPT for all contacts, or (ii) nutritional support for the index case and all contacts.

		TB treatment for index case + TPT in contacts	TB treatment for index case + nutritional support in index case and contacts
Reduction in cumulative TB incidence, per 1,000 index cases	Amongst index cases	None (index cases already incident)	
	Amongst contacts	3.8 (2.4 – 6.9)	5.2 (3.3 – 9.2)
Reduction in cumulative TB mortality, per 1,000 index cases	Amongst index cases	None	25 (20 – 32)
	Amongst contacts	0.27 (0.17 – 0.50)	0.38 (0.25 – 0.68)
ICER: USD per DALY averted		1310 (730 – 2010)	32 (25 – 41)

Table: Summary of modelled outcomes of TPT vs nutritional support in TB-affected households. For both interventions, the comparator is TB treatment for the index case alone, with no uptake of TPT or nutritional support.

Results: Scaling up TPT for all household contacts would avert 41% (95% UI: 38–45) of TB incidence and 0.7% (95% UI: 0.39–1.2) of mortality, at an estimated cost of

USD 1310 (95% UI: 730–2010) per DALY averted. In contrast, nutritional support would avert 56% (95% UI: 52–60) of incidence and 64% (95% UI: 62–66) of mortality, with a much lower ICER of USD 32 (25–41) per DALY averted (See Table). The cost-effectiveness of nutritional support was driven largely by improved survival among index cases. Assuming no mortality benefit increased the ICER to USD 1700, but even mortality reductions of 15% resulted in ICERs comparable to TPT.

Conclusions: Incorporating real-world conditions is essential in planning TB interventions. While TPT remains important, nutritional support may yield greater reductions in TB incidence and mortality among household contacts in India—and do so at lower cost.

SOA13-651-20 Nutritional support for people with or at risk of TB: A systematic review and synthesis of implementation approaches

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Background: Undernutrition is one of the five leading risk factors for tuberculosis (TB) disease. Nutritional support is therefore a key focus for TB prevention and care. There is, however, limited understanding of how nutritional interventions are implemented. This review provides a comprehensive overview of the ways in which nutritional support is provided to people with/at risk of TB.

Design/Methods: Using a systematic strategy, we searched four databases, Medline (via OVID), PubMed, Web of Science, and CINAHL for publications in English spanning January 2000 to December 2024. Articles meeting the prespecified inclusion criteria and containing data on the type of nutritional support provided were included. A „best fit" framework synthesis approach, utilizing a published logic model, provided a predefined set of themes against which data were extracted.

Results: We screened 850 publications, of which 29 were included in the framework synthesis. Studies were predominantly conducted in high TB burden countries (*n*=24), mostly in South-East Asia (n=14) or Africa (n=8). We identified seven types of nutritional intervention:
i. Food baskets;
ii. Supplementary nutrition (e.g. „e'Pap", macronutrient powders);
iii. Fortified biscuits;
iv. Food vouchers;
v. Meals consumed at health facilities;
vi. Cash transfers and;
vii. Dietary counselling.

More than half of studies indicate that local food preferences were considered (n=15). All included studies examined the effect of nutritional support within research settings (including 14 randomized controlled trials). The most common endpoint was treatment outcomes (n=10), followed by weight-gain/BMI (n=8). Table 1 summarizes themes per nutritional intervention.

Type of nutritional intervention (# Studies)	Target Population (# Studies)	Frequency of provision (# Studies)	Mode of Access (# Studies)	Cultural differences and food preferences considered (# Studies)
Supplementary Nutrition (10)	Adults newly diagnosed PTB+ (4/10) Adult (18–60 years) and children (3–6 years) (4/10) Adults diagnosed with TB (1/10) Adults 18-60 (2/10) Adults, with or without latent TB infection (1/10)	Daily (9/10) Monthly (1/10)	Distributed in community (1/10) DOTs (4/10) Home delivery (3/10) HF[a] based distribution (2/10)	Yes (8/10) No (2/10)
Food baskets (9)	TB-HIV coinfected adults (1/9) HH contacts of bacteriologically confirmed pulmonary TB patients (2/9) Adults Bac+ confirmed TB (4/9) Adults diagnosed with TB & BMI <18.5 kg/m2 (1/9) Homeless people with TB (1/9)	Daily (1/9) Weekly (2 /9) Monthly (6/9)	Home delivery (2/9) HF based community delivery (1/9) Distributed via TB HF (3/9) DOTs (2/9) NGO program (1/10)	Yes (5/9) No (2/9) Partially (1/9) Not specified (1/9)
High energy enriched biscuit (3)	Adults bac+ pulmonary TB (PTB+) co-infected with HIV (2/3) Adults diagnosed with pulmonary TB both HIV+/- (1/3)	Daily (3/3)	Distributed via TB HF (3/3)	No (3/3)
Voucher (2)	Adults & children diagnosed with pulmonary DS-TB and starting treatment during recruitment period (1/2) Adults (>18) with bac+ or clinically diagnosed with TB (1/1)	Monthly (2/2)	Distributed via TB HF (2/2)	Yes (1/2) Partially (1/2)
Cash transfer (2)	HIV-infected TB patients (1/2) Adults diagnosed with TB (1/2)	1st installment for 2 months, subsequent installments monthly if 2 months of treatment was completed (1/2)	Bank details collected via HF (2/2)	NA
Health facility-based meal (1)	Adults diagnosed with TB (1/1)	Daily (1/1)	Distributed via TB HF (1/1)	Yes (1/1)
Dietary counselling (1)	Adults with TB aged ≥18 years and <66 (1/1)	Counseling was provided at seven visits: Days 15, 30, 60, 90, 120, 150, and 180 of TB treatment (1/1)	Counselling delivered at the HF (1/1)	No (1/1)

Table.
Abbreviations: Bac+, Bacteriologically confirmed; DOT, directly observed treatment; HF, health facility; HH, household; HIV, human immunodeficiency virus; NA, not applicable; NGO, non-governmental organization; PTB+, pulmonary TB; TB, tuberculosis

Conclusions: This synthesis highlights varied approaches to the design and implementation of nutritional support interventions for people with or at risk of TB. Nutritional support has mainly been evaluated in research settings, with varied endpoints.

The financial /operational feasibility and acceptability for programmatic implementation among different target populations require more attention.

SOA13-652-20 Nutritional support improves treatment success, nutritional status, and functional recovery: Findings from the INSTITUT study

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Background: Undernutrition is a leading risk factor for tuberculosis (TB) and is associated with increased mortality. This study evaluated whether nutritional support during TB treatment improves nutritional, functional, and treatment outcomes.
Design/Methods: As part of the INSTITUT Study, adults with bacteriologically confirmed pulmonary TB were prospectively followed for 12 months in Togo and Benin. In Benin, patients routinely receive nutritional support during TB treatment, while in Togo they do not.
The primary outcome was cure.
Secondary outcomes included ≥5% weight gain at month 2 and ≥10% at month 6, adherence to treatment (defined as >90% adherence confirmed with pill counts) and sputum smear conversion after 2 months of treatment. Functional improvement was assessed by the distance gained in six-minute walk test (6MWT) distance at month 6 compared to baseline.
Multivariable models were adjusted for age, sex, baseline body mass index, multidimensional poverty index, alcohol misuse, HIV status, and other covariates significant at p≤0.20.
Results: Among 796 participants (293 in Togo, 503 in Benin), baseline characteristics were comparable. Nutritional support was significantly associated with higher odds of cure (aOR 2.96; 95% CI: 1.35–6.78), better adherence (aOR 3.01; 95% CI: 1.37–6.91), ≥5% weight gain at month 2 (aOR 1.67; 95% CI: 1.16–2.41), and ≥10% weight gain at month 6 (aOR 2.51; 95% CI: 1.65–3.85). Participants receiving nutritional support also showed a greater adjusted 6MWT distance gain of 46.31 meters (95% CI: 30.43–62.17) . No significant difference in sputum smear conversion at month 2 was observed (aOR 1.28; 95% CI: 0.78–2.07).

Outcome	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	p-value
Cure	3.97 (2.05, 7.98)	2.96 (1.35, 6.78)	0.008
Adherence	2.94 (1.82, 4.81)	3.01 (1.37, 6.91)	0.007
≥5% Weight Gain at 2 Months	1.87 (1.35, 2.59)	1.67 (1.16, 2.41)	0.006
≥10% Weight Gain at 6 Months	2.42 (1.68, 3.52)	2.51 (1.65, 3.85)	<0.001
Sputum Smear Conversion	1.78 (1.20, 2.65)	1.28 (0.78, 2.07)	0.322

Table: Impact of Nutritional Support (Benin vs. Togo).

Conclusions: Nutritional support during TB treatment was associated with improved weight gain, physical function, adherence, and cure. These findings support the integration and scale-up of nutritional support into TB programs, particularly in resource-limited settings where undernutrition remains a critical barrier to successful treatment outcomes.

SOA13-653-20 Empowering TB-affected communities: Savings groups as a social protection strategy

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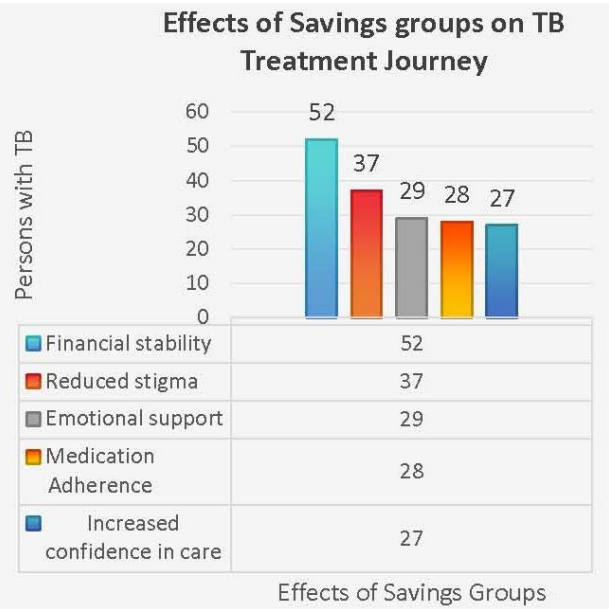
Background and challenges to implementation: In Zambia, 58% of tuberculosis (TB)-affected households face catastrophic total costs (National TB Cost Survey, 2021). TB disease is associated with economic hardship, social isolation, loss of income, reduced access to nutrition, and difficulty affording transportation to health facilities. In focus group discussions with persons with TB (PWTB), held in Lusaka, Matero township by Development Aid from People to People (national NGO) in April 2024, women reported experiencing partner violence, loss of income due to caregiver responsibilities and extreme poverty.
TB-related myths and misconceptions further affected livelihoods, as customers avoided businesses run by TB survivors or caregivers. To address these challenges, DAPP Zambia examined the effect of savings groups on

the socioeconomic well-being of people affected by TB in evaluation areas Chawama, Mandevu and Matero constituencies in Lusaka.

Intervention or response: In 2024, in the intervention group, people with or affected by TB formed 25 "Savings for Change" model groups (model endorsed by Bank of Zambia). Each group has an average 25 of members (total n=625), consisting of TB survivors, caregivers, community members and community volunteers. DAPP Facilitators provided training in cooperative savings model income generation, and financial literacy, and gave the groups ongoing support.

Results/Impact: Over a nine-month period, 82 members were interviewed for the survey. Majority interviewed, 80% (66/82) had a PWTB in Household (HH) in previous six months, 86.6% (71/82) took loans. The savings were reported being used by 76.7% (56/71) for small business investment and 25.8% (17/66) reported it reduced treatment interruptions. Savings groups became platforms for psychosocial support, foster community solidarity. PWTB reported significant reduction in TB-related stigma. (See Figure 1).



Conclusions: Community based savings groups for those affected with TB provide an opportunity to reduce catastrophic costs due the disease. Policymakers, TB programs and NGO's should consider the integration of community-based savings groups into national TB control strategies.

SOA13-654-20 Assessing the impact of climate change on TB care in Zimbabwe: A mixed-methods evaluation of community and health system needs

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Background: Climate change is increasingly affecting people living with Tuberculosis (TB) in low-resourced settings. The 2023/2024 El Niño-induced drought in Zimbabwe, for example, caused food insecurity and created increased demands on health service delivery.

We sought to assess the impact of climate change on TB services and identify the unmet needs as perceived by affected communities and their healthcare providers (HCWs) due to extreme weather events.

Design/Methods: We conducted a formative evaluation using a convergent parallel mixed-methods approach. We collected survey and clinical data among people living with HIV (PLHIV) at a sample of clinics in Zimbabwe.

We conducted in-depth interviews and focus group discussions (FGDs) with a sample of patients co-infected with TB to understand how climate change has impacted people affected by TB and their HCWs. We mapped the findings to the Consolidated Framework for Implementation Research (CFIR).

Results: Overall, 1363 of 1804 (76%) survey participants reported noticing changes in the typical climate of their communities over the past 5 years. Of those who experienced these changes, 75% reported disruptions to their HIV care due to climate change(n=1024). Three FGDs with TB/HIV co-infected individuals and three HCWs were interviewed regarding TB service delivery.

When mapped to CFIR(Figure 1), individual challenges include food insecurity (887/1024, 86%), leading to challenges in TB treatment adherence by creating competing priorities for patients. Inner setting factors included widespread community-level water and food insecurity and transportation challenges.

Outer setting factors included insufficient social (288/1024, 28%) and economic supports (329/1024, 32%) for those affected by TB. Participants discussed the need for community health outposts for decentralized community-based provision of health services (1086/1804, 60%), water/sanitation services (781/1804, 43%), nutrition support (541/1804, 30%), and transportation support (423/1804, 23%).

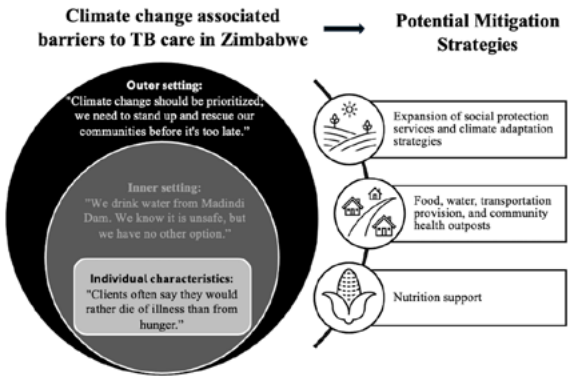

Figure 1. Mapping climate change challenges to TB care and related climate adaptation interventions in Zimbabwe using the Consolidated Framework for Implementation Research (CFIR).

Conclusions: This formative mixed-methods assessment identifies areas where health systems can target interventions to mitigate climate change challenges to TB care in Zimbabwe.

E-POSTER SESSION (EP)

EP28 Advances in diagnosis, epidemiology and management of non-tuberculous mycobacterial disease

EP28-965-20 A cross-sectional survey of people with NTM pulmonary disease

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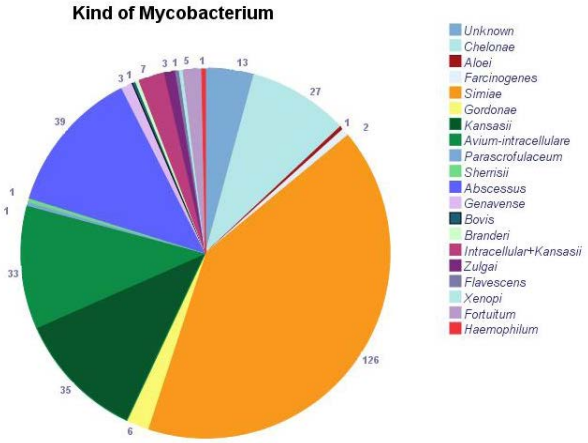
Background: In the recent decades, is increasing the incidence and prevalence of nontuberculous mycobacterial pulmonary disease (NTM-PD). There is still a challenging condition to diagnose and treat the patients effectively. We described the characteristics and outcome of treatment of these patients.
Design/Methods: We analyzed data of all patients with documented NTM (based on ATS criteria), who were admitted and treated at the hospital from Jan 2005 to Dec 2023.



Results: A total of 307 cases with NTM pulmonary disease were diagnosed. Most cases were male (N=168, 55%) and nonsmokers (N=211, 68.7%). Median age was 59 (range, 48-69). 48% of them were more than 60 years old. 11 (3.6%) were HIV positive. The most common symptom was cough (91%), followed by sputum (83%), dyspnea and weight loss (64.5%), loss of appetite (49.5%), fever and night sweat (39.7%), and hemoptysis 30%.
Cavitary lesion, bronchiectasis, and nodularity were reported in 59%, 62%, and 87.5% patients respectively.
Of 307 patients with NTM-PD caused mainly by *M. simiae* (41%), *M. abscessus* (12.7%), *M. kansasii* (11.4%), *MAC* (10.7%) and *M. chelonae* (8.8%). *M. Simiae* and *M. abscessus* patients were older than other groups (more than 60 years, 57% and 54%), but patients with *M. kansasii* and *MAC* were younger.
13 patients (9.2%) died, and NTM therapy failed in 11%.
Conclusions: This study illustrated NTM-PD is more common among male and depend on the species of mycobacterium, can be found more in younger individuals, that it is different from other countries. For better prognosis in NTM-PD patients should consider uniform implementation of the treatment guidelines.

EP28-967-20 Characterisation of NTM isolated in a TB research laboratory using whole genome sequencing, Lusaka, Zambia

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Background: Nontuberculous Mycobacteria (NTM) are ubiquitous mycobacteria species that may cause opportunistic disease in humans. This study aimed to characterize genomes of culture isolated NTMs using Whole-Genome Sequencing (WGS) and to explore their antimicrobial resistance patterns.
Design/Methods: WGS was performed on NTM isolates recovered during TB culture between November 2021 to February 2023 using an Illumina MiSeq platform. A total of 33 NTM obtained reads were assembled using Unicycler and the obtained assemblies were genotyped with NTM-profiler version 0.6.0 using the GTDB-220 database. Species were determined by achieving an Average Nucleotide Identity (ANI) of over 95% when mapped to reference genomes.
Comprehensive Antibiotic Resistance Database (CARD) was also utilized to evaluate the genomic antibiotic drug class resistance of the isolated NTMs, maintaining a stringent threshold of 90% gene coverage and 80% gene identity. Proportion analysis and visualisations were subsequently performed in R version 4.5.0.
Results: A total of 18 unique species were identified among the 33 sequenced NTM isolates. M. fortuitum was the most dominant species, accounting for 7/33 (21.2%). Other genotypes included M. syngnathidarum 3/33(9.1%), M. szulgai 3/33(9.1%), and M. avium 2/33 (6.1%).
In total, 31/33 (94%) NTM isolates had at least one gene to an antibiotic class present, with the majority of resistomes demonstrating genomic resistance to a combination of macrolides and penams 30/121 (24.7%), followed by rifamycins 28/121 (23.1%).

Furthermore, resistomes to a combination of isoniazid and rifamycin (10.7%) were also observed. The M. fortuitum species exhibited the highest genomic resistance to multiple antibiotic drug classes (penams, tetracyclines, aminoglycosides, macrolides and rifamycins).
Conclusions: Isolated NTMs had high rates of resistance to antibiotics that are recommended for treating NTM disease. The clinical significance of NTMs isolated during culture for mycobacterium tuberculosis should be interpreted with caution and should follow the criteria that is recommended for diagnosis of NTM disease.

EP28-968-20 Molecular subspeciation and antimicrobial resistance prediction in M. avium complex by whole genome sequencing

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Background: Genomic studies using whole genome sequencing (WGS) of *Mycobacterium avium* complex (MAC) is limited, particularly when aiming to identify strains at the subspecies level. Similarly, MAC-specific genetic determinates of antimicrobial resistance are not fully understood.
The aim of this study is to investigate genetic targets for AMR in MAC, with a focus on macrolides, aminoglycosides and fluoroquinolones, and to identify subspeciation targets through WGS analysis.
Design/Methods: Drug susceptibility testing (DST) of MAC isolates (n=450) from Canadian reference laboratory was compared to WGS using Illumina MiSeq. Analyses included SeqReport, Kraken, FastANI, and generation of consensus sequencing mapped to a reference genomes. Geneious Prime 2023.1.2 was used to annotate and extract target regions of the consensus genomes, including *16S, ITS, hsp65/groEL2,* and *rpoB.* Sequences were pooled and compared against a bank of established MAC reference strains using the Classify Sequences tool and compared with WGS analysis using the Average Nucleotide Identity (ANI).
Results: Using the Classify Sequences tool and ANI, we successfully demonstrated the identification ability of these genetic targets in 87% of isolates, with identification of clinically significant MAC isolates *M. avium* subsp. *hominissuis, M. intracellulare*, *M. chimaera* and M. colombiense.
We identified a *23S* mutation in 70% of our isolates with expected high clarithromycin resistance. However, a *gyrA* mutation was identified in less than 20 % of isolates with quinolone resistance, and less concordance between WGS-based prediction and aminoglycoside resistance. Our results also indicate that novel mechanisms, such as efflux-mediated resistance (*efpA_1)*, may contribute to drug resistance in 36 isolates of *M. avium* subsp. *hominissuis* isolates.
Conclusions: Our MAC genomics works has demonstrated potential of WGS for identification and subspeciation of MAC, a concordance between WGS-based AMR prediction and phenotypic DST for macrolide but not for aminoglycosides and quinolones

EP28-969-20 Real-world treatment status of nontuberculous NTM lung disease: Course, restart and regiment switch

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Background: Nontuberculous mycobacterial lung disease (NTM-LD) is a chronic infection with increasing global prevalence, particularly affecting older adults and those with structural lung conditions. Treatment is complex, prolonged, and frequently modified in clinical practice. However, real-world data on treatment discontinuation, restart, and regimen switching remain limited.
Design/Methods: This retrospective cohort study utilized data from the National Taiwan University Hospital and Taiwan's National Health Insurance Research Database (2006–2020). Adult patients diagnosed with NTM-LD were included if they received anti-NTM therapy ≥28 days. Treatment waves, restart patterns, and regimen changes were analyzed. Multivariable Cox and logistic regressions were used to identify predictors.
Results: Out of 15,589 eligible NTM-LD patients, 3,762 met the treatment criteria. Median therapy duration was 227 days; only 36.2% completed ≥12 months. Treatment discontinuation occurred in 64%, with 20.4% restarting therapy—most (73.7%) within 12 months. Among restarters, 22.4% changed regimens, often from macrolide-based to triple-drug therapy. Regimen switching was associated with prior hospitalization and suboptimal initial regimens.
Conclusions: Early discontinuation, delayed restart, and frequent regimen switching are common in NTM-LD care. These findings highlight the need for improved patient monitoring, support systems, and adherence strategies to optimize long-term outcomes.

EP28-970-20 Multiplex targeted peptidome platform for rapid identification of NTM species

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Background: Accurate identification of mycobacterial species and subspecies is critical for appropriate antimicrobial therapy, particularly for non-tuberculous mycobacteria (NTM) such as *M. avium*, *M. intracellulare*, *M. kansasii*, and *M. abscessus*. These pathogens often mimic tuberculosis clinically but require distinct treatment regimens. Conventional culture-based diagnostics are time-consuming and lack the resolution needed for precise identification.
Design/Methods: Using species- and subspecies-specific peptide markers discovered through our PEP-TORCH discovery pipeline, we developed a clinically compatible, multiplexed targeted mass spectrometry method for mycobacterial identification. This method uses FDA-approved LC-MS/MS instrumentation and quantifies taxa-specific peptides from MGIT culture filtrates with absolute precision. Stable isotope-labeled standards were used for validation and quantification.
Results: We validated this targeted method across 63 clinical MGIT samples. The assay achieved 100% concordance with PEP-TORCH predictions and accurately distinguished species and subspecies, including *M. avium*, *M. intracellulare*, and *M. abscessus* subspecies. It also quantified mixed infections, providing co-infection ratios with high reproducibility. Compared to culture-based identification, our approach reduces turnaround time from weeks to days while increasing resolution and specificity.
Conclusions: This targeted mass spectrometry platform offers a rapid, accurate, and clinically scalable solution for comprehensive mycobacterial identification. By enabling absolute quantification of species-specific peptides using widely available instrumentation, it bridges the gap between advanced proteomics and real-world diagnostic implementation.

EP28-971-20 Burden of disease in persons with NTM in three west African countries: A prospective cohort study

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Background: Non-tuberculous mycobacterial pulmonary disease (NTM-PD) is increasing globally, with previous tuberculosis (TB) a key risk factor in sub-Saharan Africa (SSA). Management depends on species, disease type, and patient factors, yet limited awareness and diagnostics may hinder detection.
This study investigates NTM prevalence, species distribution, clinical features, and drug resistance among presumptive TB patients in West Africa
Design/Methods: This prospective cohort study (2022–2024) involved adults with presumed TB in Ghana, Nigeria, and Niger. Diagnostic tests included sputum smear microscopy, Xpert MTB/RIF (in Ghana and Niger), and mycobacterial culture. NTM species were identified using Genotype CM/AS (Bruker, Germany) and/or rrs/rpoB Sanger sequencing. Drug susceptibility testing was molecular (NTM-DR, Bruker, Germany) and phenotypic. Participants with baseline NTM were enrolled. Demographic, clinical, radiological, and laboratory data were collected. Two-year follow-up evaluated clinical outcomes including survival, loss to follow-up, and species relevance to human disease based on previously described pathogenic classifications.
Results: Of 9,975 people with presumed TB screened, 112 (1.1%) had at least one positive NTM isolate at baseline (Ghana 31, Nigeria 42, Niger 39); 100/112(89.3%) were potentially pathogenic species. Most were male (65.2%), with a mean age of 50 years and weight of 51.2kg (SD12.3). Previous TB was reported in 53.6%. Common symptoms included cough (84.8%), fever (49.1%), dyspnoea (33.0%), and haemoptysis (15.2%). Smear positivity (87.5%) and cavitation (50.9%) were frequent. MAC (34.0%), *M. fortuitum* (13.4%), and *M. abscessus* (8.9%) were most common.
Most isolates were macrolide- and amikacin-susceptible. Two-year mortality was 14.3%. Cough and smear-positivity correlated with potentially pathogenic species. No other covariates were significantly associated with smear-positivity or potentially pathogenic NTM.

Table 1: NTM species per country

Runyon Classification	NTM species	Ghana	Niger	Nigeria	Total (n)	(%)	Clinically relevant according to literature
Group I - Photochromogens	*M. kansasii*	0	1	3	4	(3.6)	Yes
	M. simiae	0	1	1	2	(1.8)	Yes
	M. asiaticum	0	5	0	5	(4.5)	Yes
Group II - Scotochromogens	*M. scrofulaceum*	0	0	2	2	(1.8)	Yes
	M. gordonae	0	0	2	2	(1.8)	No
Group III - Nonchromogens	*M. avium*	1	2	1	4	(3.6)	Yes
	M. Intracellulare	11	8	15	34	(30.4)	Yes
	M. xenopi	0	0	1	1	(0.9)	Yes
	M. malmoense	1	0	4	5	(4.5)	Yes
	M. chimaera	0	2	0	2	(1.8)	Yes
	M. interjectum	1	0	1	2	(1.8)	Yes
	M. palustre	0	9	0	9	(8.0)	Yes
	M. sherrisii	0	2	0	2	(1.8)	Yes
Group IV – rapid growers	*M. abscessus* complex	3	0	7	10	(8.9)	Yes
	M. fortuitum	12	0	3	15	(13.4)	Yes
	M. chelonae complex	0	3	0	3	(2.7)	No
	M. goodie	0	0	1	1	(0.9)	No
	M.peregrinum	0	1	0	1	(0.9)	No
Unclassified	*M. bouchedurhonense*	0	1	0	1	(0.9)	No
	M. celatum	1	0	0	1	(0.9)	Yes
	M. chitae	0	0	1	1	(0.9)	No
	M. duvalii	0	1	0	1	(0.9)	No
	M. fluoranthenivorans	0	1	0	1	(0.9)	No
	M. magaritense	1	0	0	1	(0.9)	No
	M. paraense	0	2	0	2	(1.8)	Yes
	Total	**31**	**39**	**42**	**112**		

Conclusions: This study reveals the burden of NTM in West Africa, emphasising the need for improved diagnostics, tailored management, and clinical awareness to avoid unnecessary TB treatment. Understanding the clinical burden and species distribution of NTM in TB-endemic countries will increase awareness.

EP28-972-20 Geographic distribution of most prevalent NTM disease in Brazil

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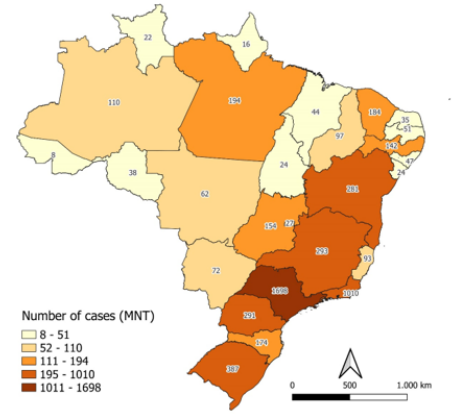
Background: Records of Nontuberculosus Mycobacteria (NTM) disease have increased over the years in Brazil and around the world. The clinical features of diseases caused by NTM often overlap with tuberculosis and other chronic lung diseases. This clinical convergence requires diagnostic differentiation to allow the definition of appropriate care and treatment and, thus, improve clinical practice.

Design/Methods: The study shows the disease occurrence by state in Brazil, based on notifications made in the Special Tuberculosis Treatment System (SITE-TB). To date, NTMs are not compulsorily notified and the cases registered, in general, were identified from the diagnostic evaluation for tuberculosis.

Results: All records from 2013 to 2024 were analyzed, totaling 5579 cases. Considering the most prevalent states, São Paulo, Rio de Janeiro and Rio Grande do Sul presented 1698, 1010 and 387 cases respectively. Analyzing the more recent period from 2020 to 2024, *M.avium* complex was the most prevalent species, followed by *M.kansasii* and *M.abscessus* group.

Regarding the three most commonly found species, the findings respectively showed female gender (55.8%, 36.9%, 58.8%), pulmonary form (86.6%, 96.7%, 85.7%), record of structural lung disease in 24.8%, 30.9% and 28.6%, immunosuppressive condition (mainly HIV) (21%, 25.7% and 19.7%), Concerning the treatment outcome (2020 to 2022), cure in 63.4%,76.4%, 59.5%, loss of follow-up in 15%, 12.4%, 12.6% and death in 11.8%,7.7%, 11.7%.

Geographic distribution of Nontuberculous Mycobacteria disease in Brazil from 2013 to 2024



Conclusions: It is worth highlighting some important findings such as a higher prevalence of *M.kansasii* in males, almost exclusively in the pulmonary form with higher cure rates. In the states with the highest prevalence, São Paulo and Rio Grande do Sul presented *M.avium* as the most frequent species, in Rio de Janeiro the most frequently found species was *M kansasii*.

The diversity of strains in Brazilian regions may be due to the timely access to culture and identification of mycobacterial species, and risk factors associated with each species.

EP29 Breaking the cycle of M. tuberculosis infection

EP29-973-20 Prevalence and risk factors of latent tuberculosis infection in Rwanda, 2024

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Background: Latent tuberculosis infection (LTBI) remains a major public health concern due to its potential to progress to active TB, especially in immunocompromised individuals. About a quarter of the global population is affected by LTBI. In recent years, Rwanda's Ministry of Health introduced tuberculosis preventive treatment (TPT) for people living with HIV/AIDS and household contacts aged 5 and above. However, WHO highlights other high-risk groups needing TPT. Understanding LTBI prevalence and its risk factors in Rwanda is crucial to guide effective TPT policies.
Design/Methods: A population-based survey using multistage cluster sampling design was used. Ninety (90) villages were randomly selected across the country, with 15 households randomly chosen in each village, and one participant selected per household. A well-structured questionnaire was administered to eligible participants in May – June 2024. IGRA tests were performed for all eligible participants, followed by GeneXpert testing and chest X-rays with integrated artificial intelligence for IGRA-positive participants, to rule out active or subclinical TB. Logistic regression was used to identify factors independently associated with LTBI positivity, as determined by a positive IGRA test, among participants without confirmed TB disease.
Results: Out of 1,350 participants, 363 were tested positive to IGRA, of which 34 were confirmed to have TB, and the prevalence of LTBI was 25.7% (329 out of 1,316). The factors that were associated with latent tuberculosis infection were male sex (AOR:1.4; 95%CI: 1.0–1.8), age group of 35-44 (AOR:2.1; 95%CI: 1.1-3.9), history of imprisonment (AOR:2.0; 95%CI: 1.0–4.1) and chronic diseases (AOR:1.9; 95%CI: 1.1-3.3).
Conclusions: One in four individuals has LTBI in Rwanda. Male sex, age 35–44, history of imprisonment, and chronic diseases were significantly associated with LTBI. These findings highlight the need of targeted prevention strategies for high-risk groups, to reduce further TB transmission.

EP29-974-20 Temporal trend of tuberculosis infection incidence in a priority municipality in Brazil (2019–2024)

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Background: The identification of Tuberculosis Infection (TBI) is a key strategy for controlling the progression to active tuberculosis (TB). Monitoring TBI incidence over time allows for the assessment of prevention policies' effectiveness and the identification of potential gaps in access to diagnosis and treatment. In this context, this study aimed to evaluate the temporal trend of tuberculosis infection incidence in Ribeirão Preto, São Paulo, from 2019 to 2024.
Design/Methods: Ecological study carried out in the municipality of Ribeirão Preto, São Paulo, Brazil, considering cases of Tuberculosis Infection (TBI) reported in the IL-TB system of the municipality. Notification rates for TBI were calculated between January 2019 and December 2024. The numerator included the total number of reported cases per month, while the denominator was the municipality's population, multiplication factor of 100,000 inhabitants. For time series analysis, the seasonal decomposition method using Loess (STL) was applied to extract the trend using RStudio® software. The Prais-Winsten regression assessed the growth, decline, or stability of the trend. When variation was detected, the Monthly Percent Change (MPC) and its respective 95% confidence interval (CI95%) were calculated using Stata 12.0 software.

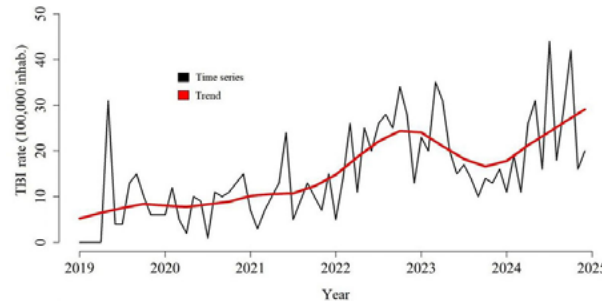

Figure 1. Temporal trend of tuberculosis case notification in Ribeirão Preto, São Paulo, Brazil (2019 - 2024).

Results: Figure 1 shows a predominantly increasing trend throughout the study period, with a brief decreasing trend between the beginning and end of 2023, followed by a return to growth in the subsequent months (MPC = 9.29; 95%CI = 5.79-12.91; p<0.01).

Conclusions: The increasing trend in TBI incidence in Brazil may be related to advancements in infection prevention strategies. The Ministry of Health has taken significant steps, including surveillance through the IL-TB system, incorporation of the IGRA test into the Unified Health System, and the introduction of new tuberculosis preventive treatment (TPT) regimens, such as 3HP.
These measures are expected to have a substantial impact on the End TB strategy, contributing to the goal of eliminating tuberculosis by 2050.

EP29-975-20 Epidemiology of tuberculosis infection among general population in a selected district of Bangladesh

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Background: About 5-10% individuals infected with tuberculosis (TB) are at risk of developing active TB disease. In TB-endemic countries like Bangladesh, understanding the situation of TB infection (TBI) among general population is crucial. For the first time in Bangladesh, we assessed the epidemiology of TBI in a selected district using QuantiFERON TB Gold Plus (QFT) assay.
Design/Methods: We conducted a cross-sectional study in Narsingdi district from October 2023 to September 2025. Households (HH) were selected through multistage cluster sampling. The HH members were enrolled, asked for TB symptoms and interviewed after obtaining informed written consent. Whole Blood (4.0 mL) was collected from the participants to perform QFT test. Frequencies and mean used to report descriptive analysis, and p-value of <0.05 considered statistically significant and regression analysis applied to identify risk factors at 95% confidence interval (CI).
Results: Of 5,506 enrolled individuals with mean (±SD) age 36.6 (±18.0) years, 23 had TB symptoms and 5,483 were asymptomatic. Overall, 812 (14.8%) tested positive for QFT. Gender distribution differed significantly between QFT positive and negative groups, with higher proportion of males among tested positive, (60.3% vs 47.9%, p<0.001).
Higher percentage of participants with positive QFT results self-reported history of diabetes (61 individuals, 7.5%) and hypertension (84 individuals, 10.3%) compared to those with negative results (p<0.01).
Risk of TBI increased with age, highest odds were observed among 65+ age group (AOR: 5.23, 95% CI: 3.23–8.45). Individuals with history of TB were 2.4 times more likely to develop TBI (AOR: 2.42; 95% CI: 1.26–4.64).
Conclusions: One in every seven individuals was found to have TBI, lower than anticipated in a TB-endemic country. Risk of TBI was higher among older adults, male and individuals with a history of TB, diabetes or hypertension. Our findings highlighted importance of implementing targeted screening and prevention strategies among high-risk groups.

EP29-976-20 Temporal and geographic variations in TB case detection: A 2023 national analysis from Nigeria

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Background: Despite global TB control efforts, significant variations persist in case detection and laboratory confirmation rates across regions and seasons, impacting disease management. This study aims to analyze temporal and geographic variations in TB case detection and laboratory confirmation using data from the National Tuberculosis and Leprosy Control Programme (NTBLCP) in Nigeria.
Design/Methods: Programmatic data from the NTBLCP reference laboratory register was retrospectively analyzed for the period of January to December 2023.The dataset included, socio-demographic information data, specimen details, and laboratory results for Acid-Fast Bacillus (AFB) smear microscopy, culture, and drug susceptibility testing (DST) from 24,573 TB patients in all 36 states in Nigeria. Spatial analysis utilizing GIS mapping to identify geographic clusters of TB patients was conducted, while temporal trends were evaluated using interrupted time series analysis to account for seasonal variations and intervention impacts.
Results: The analysis revealed significant geographic disparities, with Kano and Kaduna accounting for 28.4% of national TB detections (p<0.001), while southeast states showed 42% lower confirmation rates than northern regions (95%CI:38-46%). Temporal patterns emerged with

March-May peaks (31% above average, p=0.002) and Q3 declines (19% reduction, 95%CI:15-23%). System performance varied substantially, with median processing times ranging from 5 days (Lagos) to 14 days (rural areas), while reporting delays were associated with 37% lower treatment initiation (aOR=0.63, 95%CI:0.55-0.72).
Conclusions: Targeted interventions should deploy mobile testing units to low-detection regions, implement seasonal staffing adjustments, and establish regional specimen transport hubs. Achieving 85% uniform detection across states could reduce national TB incidence by 23%.

EP29-977-20 Diagnostic integration for sustainability in resource limited countries: A case of Zambia

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Background and challenges to implementation: Prior to integration efforts, TB Gene-Xpert platforms in Zambia were significantly underutilized, with most facilities conducting less than one test per module per day for TB diagnostics alone. Zambia implemented a series of Diagnostic Network Optimization (DNO) initiatives to integrate multi-disease testing on TB GeneXpert platforms without negatively impacting TB services. This study aimed to evaluate the impact of successive DNO implementation on Gene-Xpert utilization and TB diagnostic testing.
Intervention or response: Using OptiDx software, we first established the baseline diagnostic network based on 2022 testing demand, referral linkages, testing sites, platforms, and costs for the HIV and TB programmes respectively. We incorporated programme expansion targets, including a 200% increase in TB testing demand from 230,000 to 450,000 GeneXpert tests, and expansion of the number of referring sites from 500 to over 2,000.
Results/Impact: The DNO output identified 25 sites out of the 298 that were operating above 90% utilisation with a turnaround time at 5 days. Twenty (20) microscopy sites were earmarked for placing GeneXpert machines. A total of 255 Genexpert sites were activated for EID, 196 for Viral Load and 48 for HPV. Cost savings from the service and maintenance contract were realized, resulting in a reduced surcharge of USD 1.20 price on all tests. TB testing volumes accounted for 82% of the total volumes after integration. The device utilisation moved from an average 50% to 80%.
Conclusions: Integration of TB, HIV infant diagnosis, HPV and VL for priority groups increased device use without affecting TB services. The increased testing volumes reduced the cost of service and maintenance. This indicates that integration of services on TB diagnostic platforms is key to sustainability while maintaining quality TB care and improving overall system efficiency in resource-limited settings.

EP29-978-20 Decentralized nucleic acid amplification testing and systematic active case finding for ending tuberculosis in the Lakshadweep Islands, India

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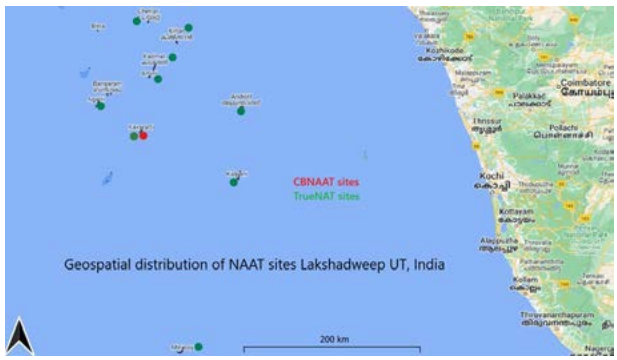
Background and challenges to implementation: The Union Territory of Lakshadweep, an archipelago of ten inhabited islands in the Arabian Sea, faced significant logistical and geographical hurdles in ending tuberculosis (TB). Monsoon-related inaccessibility and limited diagnostic resources hindered timely TB detection and care.
To address these challenges, a decentralized strategy - combining systematic Active Case Finding (ACF) with island-level Nucleic Acid Amplification Testing (NAAT), was implemented in 2019.
Intervention or response: Quarlerly, population-wide ACF campaigns were conducted from 2019 to 2024 across all ten inhabited islands. Community health workers (ASHAs) administered standardized symptom screening tools at the household level, supported by chest radiography (where feasible) and facilitated sputum sample collection. NAAT machines were deployed on each island, enabling on-site testing and eliminating inter-island transport delays.
Community health workers were vital in mobilizing the population, providing health education, and ensuring treatment adherence. Due to connectivity limitations, data were recorded using paper-based tools and digitized retrospectively.
Results/Impact: Over the five years, 70,000 individuals (100%) were screened in each round. Cumulatively, 8,274 presumptive TB cases were tested via NAAT, with 58 confirmed cases (0.7%). The annual TB incidence decreased by 60%, from 31/100,000 in 2020 to 11/100,000 in 2024. The median diagnostic turnaround time reduced from 7-10 days to less than 24 hours post-NAAT decentralization. Treatment initiation rates improved to >95%, and preliminary data suggest a corresponding rise in treatment success rates.



Conclusions: This multi-component intervention, integrating quarterly systematic ACF with decentralized NAAT, demonstrated a substantial reduction in TB incidence and enhanced care cascade efficiency in this remote island setting. The Lakshadweep model highlights the effectiveness of geographically tailored, decentralized ending TB strategies, offering potential for replication in other hard-to-reach or insular populations globally.

EP29-979-20 Delays in TB treatment among people with pulmonary TB in East Africa: Findings from a prospective cohort study

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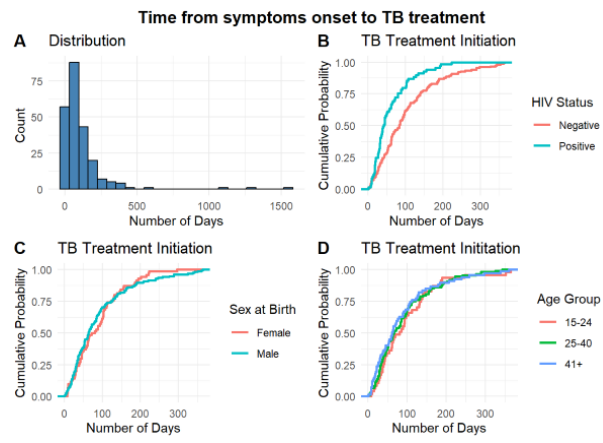
Background: Although timely tuberculosis (TB) treatment is crucial to ending the global epidemic, care delays remain a major challenge. Understanding factors associated with delayed TB care may inform programmatic interventions.

Design/Methods: The TB Sentinel Research Network of the International epidemiology Databases to Evaluate AIDS is a global prospective study of people aged ≥15 with pulmonary TB. At sites in Eldoret, Kenya, and Mbarara, Uganda, questionnaires ascertained timing from TB symptom onset to treatment initiation; number and setting of healthcare visits prior to TB diagnosis; symptoms; demographics; food insecurity; and TB- and HIV-related stigma. Robust negative binomial regression was used to examine factors associated with longer duration from TB symptom onset to treatment initiation.

Results: Among 239 participants—median age 33 years (IQR 25-44), 67% male, 30% people living with HIV (PLHIV), 50% urban—median duration from TB symptom onset to treatment initiation was 67 days (IQR 33-130) (Figure). The median number of healthcare visits prior to diagnosis was 2 (IQR 1-3).

Longer time to treatment was associated with female sex: adjusted incidence rate ratio (aIRR): 1.45, 95% CI (1.14-1.85) and previous care-seeking at a traditional healer, aIRR: 3.14 (2.15-4.61) or pharmacy, aIRR: 1.40 (1.09-1.79). Shorter duration to treatment initiation was associated with urban residence, aIRR: 0.74 (0.58-0.94), HIV-positive status, aIRR: 0.43 (0.33-0.57), and presenting with dyspnea, aIRR: 0.71 (0.54-0.93) or fatigue, aIRR: 0.45 (0.32-0.64).

Among PLHIV, perceived community HIV stigma was associated with delay, aIRR: 1.52 (1.05-2.18), but felt HIV stigma was associated with shorter time to TB treatment initiation, aIRR: 0.67 (0.47-0.97).



Conclusions: Women, rural residents, and persons without HIV were particularly affected by delayed TB treatment and should be targeted in TB case-finding efforts. Education and awareness efforts with pharmacies and traditional healers should be considered. Effects of HIV-related stigma should be examined further.

EP29-980-20 Building blocks for prevention: A health system strengthening approach to scaling up TB preventive treatment in Pakistan

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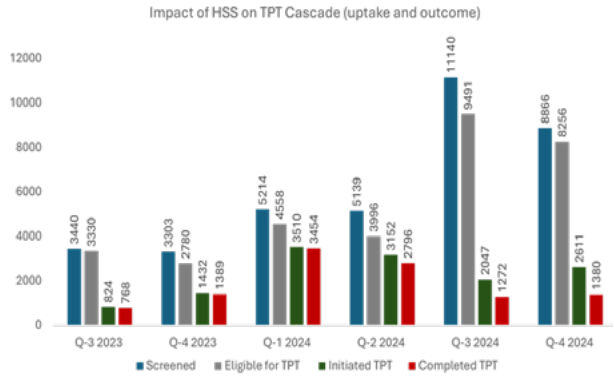
Background and challenges to implementation: Pakistan, one of the high TB burden countries, has historically struggled to implement TB preventive treatment at scale. Major barriers included provider knowledge gaps, human resource constraints, fragmented data-systems, and limited community-engagement. This initiative aimed to demonstrate how a health system strengthening model—combining digital tools, capacity building, multisectoral-coordination, and community-driven approaches—could effectively scale-up TPT access and adherence.
Intervention or response: Led by local stakeholders, the intervention implemented a health systems strengthening (HSS) model across three provinces, focusing on building capacity and enhancing service delivery. It trained 150 healthcare-providers, 200 Lady Health Workers (LHWs), and empowered TB survivors as TPT advocates. The ePreventTB digital platform, integrated with the national DHIS2 system, supported real-time data and stock management. Activities included household contact screening, outreach camps, and social support for adherence. Advocacy at district and provincial levels embedded TPT into planning. Challenges like drug-stockouts and lack of tools were addressed through emergency redistribution, interim regimens, and simplified recording and reporting systems.



Results/Impact: Over an 18-month period, a total of 37,102 individuals were screened, of whom 32,501 (88%) were found eligible for TB preventive treatment (TPT). Among those eligible, 13,576 (42%) initiated TPT, and 11,059 (82%) completed the regimen. The use of digital tools played a critical role in timely follow-up, effective monitoring, and improved continuity of care throughout the intervention. Resulted in a significant improvement compared to the previously negligible national coverage baseline. However, the progress was intermittently hindered by frequent shortages of TPT, which affected the number of individuals able to initiate treatment.
Conclusions: A HSS approach—centered on digital innovation, workforce development, and community engagement—can significantly boost TPT coverage, even amid logistical and supply chain challenges. Pakistan's experience demonstrates that institutional integration, responsive supply chain measures, adaptable tools, and community-driven delivery are critical for sustaining and scaling up TPT in high-burden settings.

EP29-981-20 Managing TB in situations of insecurity and conflict: Experiences from West and Central Africa

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Background: In West and Central Africa, political instability, terrorism, conflicts, natural disasters, and health emergencies hinder health care, including TB. We examined how these issues affect tuberculosis control and how National Tuberculosis Programs (NTPs) adapt in the region.
Design/Methods: A cross-sectional study was conducted among the 27 NTPs of the WARN/CARN regional TB network. A semi-structured questionnaire was administered by the WARN/CARN-TB executive secretariat to the NTP heads between April to September 2024 which sought to 1) map current security crises in the region(defined as an event or series of events representing a critical threat to the health, safety, security or well-being of a community or other large group of people, usually in a large area), 2) assess the impact of these crises on TB management and 3) collect information on mitigation strategies.
Results: Responses were received from 23 of the 27 countries in the network (85%) with 11 countries indicating current security crises (47.8%), most frequently due to terrorist attacks (45%). Socio-political instabilities (27%), internal armed conflicts (18%) and natural disasters (18%) were others causes of security crises in the region. Two countries reported multiple security crisis (18%). The impacts included disruption in drugs and diagnostics supplies, loss of patient follow-up, disrupted supervision activities and diminished TB financing. Various adaptation strategies were implemented, such as the use of digital tools for remote patient monitoring or supervision

activities, engaging the community and decentralizing TB services to expand the reach into communities. Security crises led to significant cross-border influxes of TB patients from neighboring countries presenting additional challenges for TB management and service provision.
Conclusions: These findings suggest that security crises are widespread and disruptive. This information will be utilized to create an SOP for NTPs, featuring the best current practices from the region.

EP29-982-20 Implementation of cascade monitoring of TB prevention in Ukraine: Achievements and challenges in the context of war

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Background and challenges to implementation: According to the WHO, 25% of the world's population is infected with the mycobacterium tuberculosis. In the context of the war against Ukraine, due to population migration, destroyed infrastructure, constant rocket attacks, lack of human resources and limited access to medical care, especially in areas where active hostilities are taking place, the prevalence of TB is increasing. The introduction of short TB preventive treatment regimens will have significant benefits for both individuals and public health.
Intervention or response: Ukraine has implemented modern algorithms for the diagnosis and treatment of TB infection in national standards in accordance with the latest WHO recommendations and include diagnosis of TB infection among high-risk groups and short rifapentine preventive treatment regimens, regular cascade monitoring of examination, prescription of preventive treatment and tracking of treatment outcomes among both contact and other risk groups, such as people receiving immunosuppressive therapy, people with silicosis, and HIV infection.
Results/Impact: During the second half of 2024, 43502 people at risk for TB infection diagnosis and treatment were identified in Ukraine. After exclusion of TB, 38712 people (89%) were subject to TB infection diagnosis, 19090 (49%) were diagnosed, 4974 (26%) were diagnosed with TB infection, 12146 (28%) were indicated for preventive treatment (including those for whom TB diagnosis is not required - children under 5 years of age and PLHIV), and 9780 (81%) started treatment.
Conclusions: In the context of war, active expansion of access to TB diagnostics, implementation of cascade monitoring of TB diagnosis and treatment not only among contact persons but also among other priority groups is extremely important to reach all those who need it and, as a result, to avoid the negative consequences of increased TB infection.

EP30 Economic evaluations to improve TB care

EP30-983-20 Global impact of the BPaL/BPaLM regimens on tuberculosis treatment outcomes and costs: A modeling analysis

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Background: The 6-month regimen of bedaquiline, pretomanid, and linezolid, with or without moxifloxacin (BPaL/BPaLM), is recommended by the WHO for treatment of most rifampin-resistant tuberculosis (RR-TB) and is being rapidly scaled up globally. BPaL/BPaLM is highly efficacious, safer, and cost-saving compared to previous RR-TB regimens. We estimated the global impact of BPaL/BPaLM on treatment outcomes and costs.
Design/Methods: Based on current regimen usage and country-reported projections, we estimated the proportion of people treated for RR-TB who would initiate BPaL/BPaLM and other categories of regimens in 215 countries over 2025-2034.
We also considered usage of these other regimens under a comparator scenario without BPaL/BPaLM. We combined estimates of regimen usage with data on regimen-specific treatment outcomes from operational research and projections of the number of people treated for RR-TB over time to estimate the numbers of people experiencing treatment success, failure, death, and loss-to-follow-up under each scenario.
We used Global Drug Facility prices and non-drug costs from the SLASH-TB model to estimate global savings from BPaL/BPaLM.
Results: We projected 2.0 million people would be treated for RR-TB over 2025-2034, with 1.8 million receiving BPaL/BPaLM under the BPaL/BPaLM scenario (Figure).
Under the comparator scenario without BPaL/BPaLM, we projected 1.4 million treatment successes (71% of people treated), 374,000 deaths (14%), 62,000 failures (3%), and 256,000 losses to follow-up (13%).
Depending on the extent to which early operational research-based outcomes can be replicated as BPaL/BPaLM is scaled up, treatment successes could increase to 1.6-1.8 million (78-91% of people treated) and deaths could decrease to 68,000-154,000 (3-8%). Drug and non-drug costs were projected to decrease from $976 million to $893 million and from $3.1 billion to $2.1 billion, respectively.
Conclusions: Over 10 years, anticipated uptake of BPaL/BPaLM could result in up to 416,000 additional treatment successes, 206,000 lives saved, and $1.1 billion in savings.

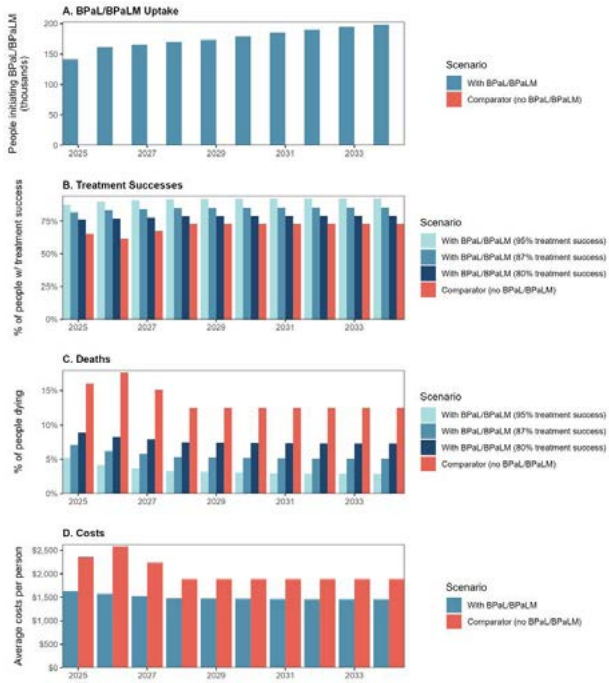

Figure: Projected treatment outcomes and drug costs with and without BPaL/BPaLM.
Figure shows number of people with RR-TB initiating BPaL/BPaLM (panel A), annual average treatment successes and deaths (panels B and C), and annual costs per person treated (panel D, with both drug and non-drug costs) from 2025-2034, under a scenario with current levels and anticipated scaleup of BPaL/BPaLM (blue bars) and a comparator scenario without BPaL/BPaLM (red bars). Treatment outcomes varied across three scenarios with BPaL/BPaLM that varied in the probability of treatment success among those initiating BPaL/BPaLM (95%, 87%, and 80%).

EP30-984-20 Evaluating the clinical and economic impact of isoniazid resistance detection in tuberculosis molecular testing in Indonesia

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Background: Indonesia ranks as the second-highest tuberculosis (TB) burden country globally, with approximately 16% of TB cases estimated to be isoniazid (INH)-resistant. While rifampicin (RIF) resistance is currently prioritized in molecular testing, the limited detection of INH resistance may delay optimal treatment. Early identification of both RIF and INH resistance has the potential to inform more appropriate regimens, reduce poor treatment outcomes, and mitigate the risk of drug resistance amplification. This study evaluates the clinical and eco-

nomic impact of incorporating INH resistance testing alongside current RIF resistance testing within molecular diagnostic algorithms in Indonesia.
Design/Methods: A decision tree model was developed to compare outcomes between two diagnostic strategies:
1. Molecular testing for RIF resistance only, and;
2. Testing for both RIF and INH resistance.
The analysis was conducted from a societal perspective, using estimates based on 1,060,000 individuals undergoing molecular testing in Indonesia in 2023. Data sources included WHO reports, published literature, national program data, and patient surveys.
Outcomes evaluated included treatment success, failure, relapse, loss to follow-up, mortality, and resistance acquisition. Economic outcomes included diagnostic and treatment costs, and cost per successful TB treatment.
Results: Compared to RIF-only testing, incorporating RIF+INH resistance detection resulted in an estimated 20.7% increase in initial diagnostic and treatment costs in the first cycle. However, there were substantial cost reductions in subsequent treatment cycles due to fewer cases of relapse, treatment failure, and resistance acquisition in patients with INH-resistant TB. Costs related to loss to follow-up were also lower. Overall, the average direct medical cost per treatment success was reduced by approximately USD 9.
Conclusions: Expanding molecular testing to include INH resistance may improve treatment targeting and reduce long-term programmatic costs, despite higher initial expenditures.
These findings support further evaluation of broader drug resistance detection strategies to enhance TB care and control.

EP30-985-20 Cost impact of improving test performance in community screening

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Background: GeneXpert Ultra's specificity has usually been assessed among individuals who present in clinics with signs or symptoms suggestive of tuberculosis (TB). However, test performance is likely different in a community population, where lower disease prevalence would increase the number of false positive diagnoses, impacting both individuals treated and health system costs.
We evaluated the potential impact of improved specificity of GeneXpert Ultra on treatment costs for community screening.

Design/Methods: We adapted a deterministic TB model for South Africa, Brazil and India. Community screening was introduced with a five-year scale-up (2025–2030), continuing until 2035. From 2030, each year, the intervention screened 80% of adults who were not receiving TB treatment, using chest X-ray with confirmatory GeneXpert Ultra. We modelled four scenarios reducing the probability of a false positive result from GeneXpert Ultra by 50%, 75%, 90%, and 95%, and compared them to a baseline scenario with specificity from community-based studies and literature. We considered false positive diagnoses to include individuals with a positive GeneXpert Ultra result, but without bacteriologically non-confirmed or bacteriologically confirmed TB. Budget impact estimates were compared across scenarios to assess epidemiological and economic impact.
Results: Number of individuals initiating treatment was reduced by 14-17% (for 50% reduction) to 35-61% (for 95% reduction scenario). A 50% reduction in the probability of false positives decreased treatment costs from 64 to 787 million USD (14-30% of total treatment costs) across India, South Africa, and Brazil, while a 95% reduction led to savings of 122 million to 1.4 billion USD (27-56%) (Figure). Country-specific variations in impact on treatment costs were driven by DR-TB prevalence and regimen costs.

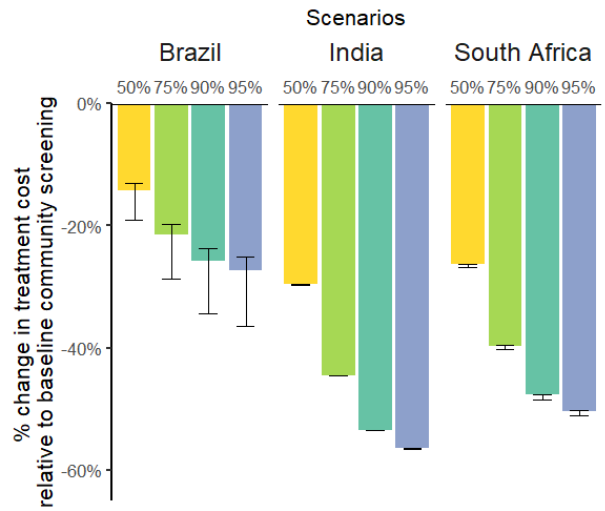

Figure. Proportional reduction in treatment costs of community screening - by country.

Conclusions: This study highlights the need to quantify test performance in real-world settings, including community screening, to avoid overestimating the impact on individuals and health system costs from overtreatment.

EP30-987-20 Chest X-ray and Xpert MTB Rif-Ultra more accurate but costlier than symptom-based screening for same day TB screening, diagnosis and treatment initiation

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Background: Uganda has implemented Mobile clinics fitted with Chest X-ray, CAD4TB and GeneXpert among high-risk patients. We thought to determine costs of conducting same-day TB screening, diagnosis, and treatment initiation.

Design/Methods: Costs were collected using a standardized WHO cost data collection tool on Fixed costs(van, license, servicing and maintenance), Variable costs(Testing and treatment costs, sputum cups, Xpert test) other costs like fuel, internet stationery, sample referral, human resource level of effort(LOE), we divided direct costs into capital and recurrent costs based on direct human resource contribution(ratios of LOE across all ACF activities, weighted based the total person-time contribution). This data was evaluated against service utilization (e.g. number of patients). The main outcomes of the analysis included 1) unit costs of key service/activity ACF components (calculated based on direct total costs of each discrete service/activity divided by the total number of patients who received the service); and 2) cost per yield (presumptive and confirmed TB diagnosis), we compared these to catastrophic costs covering all aspects.

COST CALCULATIONS

Fixed Costs	Over Study Period		Per Person Screened		Per Person Positive and		Percent of Costs
Van and License	UGX	198,814,177	UGX	34,516	UGX	2,485,177	23.4
Servicing and Maintenan	UGX	98,599,845	UGX	17,118	UGX	1,232,498	11.6
Annual Salary Costs							
Van Staff	UGX	245,314,936	UGX	42,589	UGX	3,066,437	28.9
Supportive Staff	UGX	92,620,800	UGX	16,080	UGX	1,157,760	10.9
Testing and Treatment Costs							
Sputum Cups	UGX	387,932	UGX	67	UGX	4,849	0.0
Xpert Tests	UGX	100,036,060	UGX	17,367	UGX	1,250,451	11.8
Treatment	UGX	33,286,000	UGX	5,779	UGX	416,075	3.9
Other Costs							
Fuel	UGX	77,063,569	UGX	13,379	UGX	963,295	9.1
Internet and Stationery	UGX	419,049	UGX	73	UGX	5,238	0.0
Sample Transport	UGX	2,409,813	UGX	418	UGX	30,123	0.3
TOTAL	UGX	848,952,182	UGX	147,388	UGX	10,611,902	100.0
	USD	229,217.09	USD	39.79	USD	2,865.21	100.0

Results: In six months, a total of 5760 people were screened with X-Ray, 1172 tested with Xpert and a total of 80 people were positive, 98% were treated and initiated on the same day. Annual salaries accounted for 40% of the total costs, followed by fixed at 32%, testing and treatment at 16%, and other costs at 9%. Total costs over the study period were 229,217 USD. It cost 39.8 USD per-person screened and 2,865.21 USD per-person positive and treated.

Background and challenges to implementation: Portable X-ray, CAD, and GeneXpert fitted on Mobile TB clinic for enhancing TB detection among high-risk patients, has been implemented in Uganda, we thought to determine mobile TB clinics costs of conducting same-day TB screening, diagnosis, and treatment initiation.

Intervention or response: Costs were collected using a standardized WHO cost data collection tool on Fixed costs(van, license, servicing and maintenance), Variable costs(Testing and treatment costs, sputum cups, Xpert test) other costs like fuel, internet stationery, sample transport, human resource level of effort(LOE), we divided direct costs into capital and recurrent costs based on direct human resource contribution (ratios of LOE across all ACF activities, weighted based the total person-time contribution). This data was evaluated against service utilization (e.g. number of patients) over the entire program. The main outcomes of the analysis included 1) unit costs of key service/activity components of the ACF intervention (calculated based on direct total costs of each discrete service/activity divided by the total number of patients who received the service); and 2) cost per yield (cost per presumptive TB patient identified and per confirmed TB diagnosis).

Results/Impact: In six months, a total of 5760 people were screened with X-Ray, 1172 tested with Xpert and a total of 80 people were positive, 98% were treated and initiated on the same day. Annual salaries accounted for 40% of the total costs, followed by fixed at 32%, testing and treatment at 16%, and other costs at 9%. Total costs over the study period were 229,217 USD. It cost 39.8 USD per-person screened and 2,865.21 USD per-person positive and treated.

Conclusions: In the short term, the mobile TB clinic model proved costly and exceeded typical benchmarks. We recommend scaling up this intervention beyond 6 months to maximize efficiencies and lower per-person costs, as marginal costs are expected to decrease significantly with increase in the number of people screened and treated, thereby averting future transmission and offsetting future societal burdens.

EP30-988-20 Patient and household costs of DR-TB care-seeking: Results from the Bring BPaL2Me trial in South Africa

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Background: Tuberculosis (TB), disproportionately affects the poor and marginalised. Pre-treatment costs can impede an already financially constrained individual/household, restricting care-seeking, and once in care, serve as a barrier to optimal treatment outcomes. We describe pre-drug-resistant (DR)-TB treatment patient and household costs in South Africa.
Design/Methods: As part of the Bring BPaL2Me cluster randomised trial, adults (≥18 years) initiating DR-TB treatment in South Africa's Eastern Cape and KwaZulu-Natal provinces were surveyed using the World Health Organization (WHO) patient cost instrument, retrospectively recalling costs associated with TB care-seeking prior to diagnosis. Costs were categorized broadly into direct (medical and non-medical), indirect (opportunity costs), and household/family costs, and stratified by pre-treatment provider. We present mean costs in 2025 United States Dollars (USD).
Results: A total of 569 patients initiated DR-TB treatment and completed the baseline patient cost survey between July 2023-March 2025. Participants were male (358; 62.9%), with a mean age of 38.8±11.8 years, and most living with HIV (304; 53.4%). Approximately, half (314; 55.2%) were diagnosed and initiated treatment at study enrolment, and half (255; 44.8%) sought care for their TB-symptoms, at up to 4 healthcare providers prior to diagnosis.
On average, pre-DR-TB treatment patient costs were $30.8 per patient, driven primarily by direct medical costs ($20.2) and specifically, hospitalisation ($78; n=11/569 (1.9%)), consultation ($10), and medication ($3.7) costs. This was followed by indirect costs ($15.4) and lastly by direct non-medical costs ($8.3), driven by transport and food costs across both outpatient visits and hospital admissions (Table 1).
Conclusions: Even before obtaining a formal diagnosis, patients incur costs of $30.8 across multiple healthcare providers (equivalent to a month's pre-diagnosis household income $32.4). In settings like South Africa, where TB services are provided at zero-cost, costs incurred whilst seeking a DR-TB diagnosis can be detrimental to patients' economic well-being and subsequent TB treatment.

Cost category	Description	Provider 1[1] (n=241)	Provider 2[1] (n=39)	Provider 3+[1] (n=9)	Total (N=255)
Direct medical costs (a)	Consultations	9.3 (28.4)	2.3 (7.1)	9.7 (13.9)	10.0 (28.8)
	Radiography (imaging)	1.3 (11.3)	0 (0)	0 (0)	1.3 (11.2)
	Procedures	0 (0)	0 (0)	0 (0)	0 (0)
	Laboratory tests	0.5 (4.8)	0 (0)	0 (0)	0.5 (4.8)
	Medications / drugs	2.9 (10.9)	3.4 (14.7)	6.5 (14.5)	3.7 (12.7)
	Other	0.7 (5.3)	1.1 (5.6)	3.2 (7.2)	1.0 (5.9)
	Total without hospitalisation	14.7 (45.9)	6.8 (18.3)	19.4 (29.8)	16.4 (47.7)
	Hospitalisation[*]	..	..	..	78.0 (234.1)
	Total with hospitalisation	..	..	..	**20.2 (72.0)**
Direct non-medical costs (b)	Transportation	4.0 (6.1)	4.6 (5.9)	2.3 (2.0)	4.9 (6.9)
	Food / supplementation	2.2 (4.4)	1.6 (3.9)	0.2 (0.5)	2.5 (4.7)
	Accommodation	0 (0)	0 (0)	0 (0)	0 (0)
	Other	0.3 (2.2)	0.02 (0.1)	0 (0)	0.3 (2.2)
	Total without hospitalisation	6.5 (9.3)	6.2 (8.4)	2.5 (2.0)	7.7 (10.1)
	Hospitalisation - transport[*]	..	..	..	6.9 (9.0)
	Hospitalisation – food[*]	..	..	..	5.1 (8.0)
	Hospitalisation – accommodation[*]	..	..	..	0 (0)
	Hospitalisation - other[*]	..	..	..	2.2 (5.2)
	Hospitalisation - total[*]	..	..	..	14.2 (18.8)
	Total with hospitalisation	..	..	..	**8.3 (11.6)**
Indirect costs human capital approach[*] (c)	Travel time (minutes)	112.1 (230.4)	77.1 (73.9)	455.7 (1,108.8)	138.0 (312.7)
	Visit time (minutes)	400.0 (787.5)	253.2 (248.5)	612.1 (1,175.3)	457.3 (862.4)
	Total (minutes)	507.8 (885.5)	322.0 (285.0)	1,067.9 (2,275.4)	592.3 (1,055.7)
	Travel time (cost)	2.8 (2.6)	8.5 (2.3)	1.8 (0.6)	3.0 (3.1)
	Visit time (cost)	10.0 (18.1)	10.1 (9.8)	14.1 (17.2)	12.7 (20.6)
	Total (cost)	12.1 (19.0)	13.3 (10.9)	15.8 (17.0)	**15.4 (22.4)**
Family / household costs[§] (d)	Total (including transport, food, accommodation costs)	..	..	..	**0.8 (1.8)**
Total (a+b+c+d)		23.7 (49.8)[¶]	17.4 (21.2)[¶]	34.6 (36.0)[¶]	**30.8 (71.4)**

DR-TB: drug-resistant tuberculosis; USD: United States Dollar.

All costs reported as means with standard deviations. Average exchange rate Q1 2025: 1 USD = 18.51 South African Rands (ZAR).

[1]Provider 1, 2 and 3+ were not mutually exclusive and patients may have visited a combination of providers prior to diagnosis and initiation.

[*]N=11/569 (1.9%) reported being hospitalised for TB-related symptoms prior to diagnosis; Pre-treatment hospitalisation costs not reported by pre-treatment provider.

[†]Monetary value of health seeking time. Limited to patients with a non-missing or non-zero-value pre-diagnosis individual income and non-missing or non-zero-value pre-diagnosis weekly working hours.

[§]Family / household costs not reported by pre-treatment provider.

[¶]Excluding pre-treatment hospitalisation costs and family / household costs as these costs are not reported by pre-treatment provider.

Average pre-diagnosis monthly household income = $32.4.

Table 1. Pre-DR-TB treatment patient and household costs in 2025 USD, by cost category and provider (N=569).

EP30-989-20 Catastrophic cost of TB-related death: Results from a cluster-randomised controlled trial in South Africa

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Background: Tuberculosis (TB), disproportionately affects the poor and marginalised. While seeking diagnosis and completing treatment, 32-83% of patients/households incur catastrophic costs, defined as TB-related costs ≥20% of annual pre-TB household income. However, costs attributed to TB-related death are not well understood. This

is particularly pertinent, as TB is a leading cause of death in South Africa. We describe funeral/burial costs of TB-related death and the payment categories utilised to cover these expenses.

Design/Methods: As part of an intensified household contact tracing cluster-randomised trial, index TB-patients (living, or deceased ≤6 weeks after a confirmed TB diagnosis) residing in two high TB/HIV co-infection South African provinces (Free State, and Limpopo), were surveyed using a standardised patient cost instrument. Funeral and burial costs associated with TB-related death, payment categories utilised, and household income were recorded. Mean costs are presented in 2025 United States Dollars (USD).

Results: A total of 282 index TB-patients (or their households) were surveyed from April 2017-March 2019. Over 15-months of follow-up, 44 (15.6%) TB-related deaths were recorded, most occurring soon after TB diagnosis (41; 93.2%) within a mean of 36.3±67.4 days.

Average funeral/burial costs were $1,310 per household, paid for primarily through funeral insurance payouts ($731.9), household direct out-of-pocket payments ($409.3), guest contributions ($236.4) and household dissaving's (securing loan/s and/or selling assets) ($173.3). Across wealth quintiles, households had an average funeral/burial shortfall of $558. While more common among households in lower wealth quintiles (88.9%, 50%, and 46.2% in the bottom three quintiles, respectively), half of households with a TB-related death (21; 50%) experienced catastrophic costs (Table 1).

Table 1. Household cost of TB-related death and payment category/method by wealth quintile (N=44)

Expense and payment category (2025 USD* mean, std)	Wealth quintile‡ 1: 50-$648.3 p/y (n=11)	Wealth quintile‡ 2: $648.3-$1,945 p/y (n=4)	Wealth quintile‡ 3: $1,945-$2,269 p/y (n=13)	Wealth quintile‡ 4: $2,269-$4,537 p/y (n=7)	Wealth quintile‡ 5: >$4,537 p/y (n=9)	Total (N=44)
Funeral/burial expenses (A)	$1,335 ($764)	$1,680 ($2,154)	$905.0 ($647)	$1,557 ($847)	$1,640 ($1,060)	$1,310 ($991.0)
Household (out-of-pocket payments)† (B)	$93.3 ($177.7)	$1,195 ($2,231)	$447.6 ($695.6)	$328.5 ($331.7)	$448.6 ($468.3)	$409.3 ($826.6)
Guest contributions§ (C)	$212.2 ($276.3)	$249.9 ($445.7)	$59.0 ($78.9)	$172.9 ($156.6)	$650.6 ($409.2)	$236.4 ($324.1)
Household (dissaving's payments)¶ (D)	$194.0 ($283.5)	$51.3 ($46.2)	$235.7 ($559)	$4.3 ($9.7)	$234.1 ($303.2)	$173.3 ($360.3)
Funeral insurance pay-outs (E)	$577.1 ($342.4)	$244.9 ($221.8)	$372.9 ($376.9)	$1,476 ($1,256)	$1,162 ($1,330)	$731.9 ($975.8)
Total income (F)=(B+C+D+E)	$1,076 ($878.5)	$1,680 ($2,185)	$1,016 ($1,013)	$1,926 ($1,119)	$2,161 ($1,877)	$1,443 ($1,352)
Funeral/burial (shortfall)** (A-F)	$1,112 ($850.0)	$435.4 ($-)	$208.7 ($260.2)	$432.2 ($-)	$603.3 ($406.4)	$558.4 ($587.5)
Catastrophic costsΔ (n, %)	8 (88.9%)	2 (50.0%)	6 (46.2%)	3 (42.9%)	2 (22.2%)	21 (50.0%)

TB: tuberculosis; USD: United States Dollar; std: standard deviation; p/y: per year.

*Average exchange rate Q1 2025: 1 USD = 18.51 South African Rands (ZAR).

‡Wealth quintile based on annual pre-TB household income.

†Direct out-of-pocket payments made by household members.

§Financial contributions from guests visiting the household / at the funeral.

¶Funds sourced through securing loan/s and/or selling asset/s.

**Limited to patients/households were total funeral/burial expenses > total payments across payment categories (n=17). Funeral/burial costs exceeding total payments - (household direct out-of-pocket payments, guest contributions, household dissaving's and funeral insurance pay-outs).

ΔI(total funeral/burial expenses – funeral insurance pay-outs)/(annual pre-TB household income)I ≥ 20% threshold.

Average annual pre-TB household income = $2,703±$2,278

Conclusions: Without accounting for pre-diagnosis and on-treatment costs, half of households experiencing TB-related death incurred catastrophic costs resulting from funeral/burial expenses. Additionally, the cost of TB-related death ($1,310) was equivalent to half a year's household income ($2,710), likely financially devastating for surviving household-members.

EP30-990-20 Cost-effectiveness of community tuberculosis screening in South Africa

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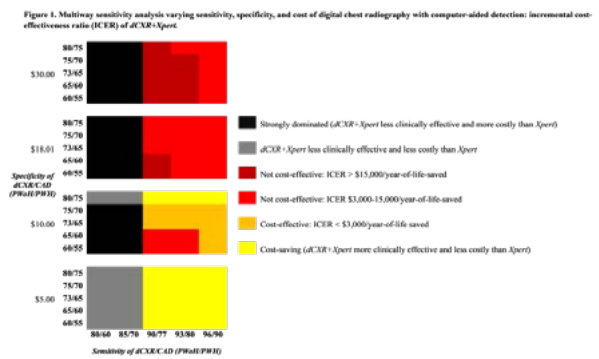
Background: The World Health Organization recommends community-based tuberculosis active case finding using digital chest radiography with computer-aided detection (dCXR/CAD) and/or rapid molecular diagnostics, but the clinical and economic outcomes are unclear.

Design/Methods: Using a microsimulation model, we evaluated four community-based tuberculosis screening strategies for adults in South Africa: (1) dCXR/CAD (*dCXR*); (2) sputum Xpert Ultra (*Xpert*); (3) dCXR/CAD followed by confirmatory sputum Xpert (*dCXR+Xpert*); and (4) *No Screening*. In *dCXR+Xpert*, individuals with a negative sputum test or unable to provide sputum may be referred for empiric tuberculosis treatment. In the base case, tuberculosis disease prevalence (people without HIV [PWoH]/people with HIV [PWH]) was 0.64%/1.23%. Sensitivity/specificity/cost for dCXR/CAD were 90%/73%/$18 for PWoH and 77%/65%/$18 for PWH; for Xpert Ultra, they were 91%/99%/$29 for PWoH and 69%/98%/$29 for PWH. Model outcomes included life-years, costs, and incremental cost-effectiveness ratios (ICERs), where ICERs <$3,000/year-of-life saved (YLS) (opportunity cost-based threshold) would be cost-effective. We conducted sensitivity analysis around dCXR/CAD sensitivity/specificity/cost and other key parameters.

Results: In the base case, *dCXR* identifies the most individuals with tuberculosis but also produces the most false-positives, yielding higher life-years and costs as more people initiate tuberculosis treatment. *Xpert* yields the fewest number of individuals initiating tuberculosis

treatment, and *dCXR+Xpert* produces the fewest false-positives. At the lifetime horizon, *Xpert* and *dCXR* are both cost-effective (ICERs $1,060/YLS and $1,350/YLS). Given currently reported performance characteristics of dCXR/CAD and an estimated dCXR/CAD cost of $18/person, *dCXR+Xpert* could be cost-effective if tuberculosis prevalence (in PWoH/PWH) is ≥1.75%/3.38%. *dCXR+Xpert* could also become cost-effective when dCXR/CAD sensitivity or specificity are higher, or dCXR/CAD cost is lower (Figure 1).



Conclusions: *Xpert* and *dCXR* are likely cost-effective community tuberculosis screening strategies in South Africa but may require substantial scale-up investments. Higher tuberculosis prevalence or technological advances or cost reductions for dCXR/CAD could make *dCXR+Xpert* a cost-effective alternative.

EP30-991-20 The impact and cost of using mobile digital X-ray units to detect pulmonary tuberculosis in South Africa

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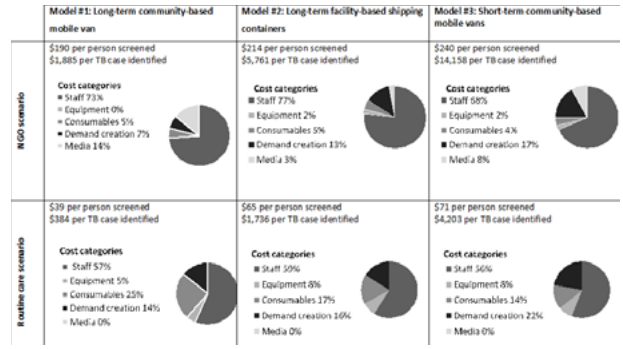
Background: Digital chest X-ray (dCXR) with computer-aided detection tools can assist in early TB diagnosis, closing diagnostic gaps left by symptom-based screening and limited access to confirmatory tests.
This study estimated the impact and cost of three dCXR delivery modes in detecting pulmonary TB (PTB): one long-term community-based mobile van (LT-vans), five long-term facility-based containers (LT-containers), and three short-term community-based mobile vans (ST-vans).

Design/Methods: We collected cost and outcome data alongside pilot implementation of nine dCXR units deployed in four districts across two provinces (Western Cape and KwaZulu-Natal) in South Africa for 1-19 months per district in 2020-2022. High TB prevalence sites were selected using geographic information system (GIS) hotspot mapping. Electronic study databases provided data on dCXR screening positivity. Economic and financial costs were estimated from the provider perspective in 2024 US$, based on micro-costing and expenditure analysis. Costs from pilot implementation were adjusted for routine implementation based on expert opinion.
Results: A total of 34,110 clients were screened using dCXR; 8,605 (25.2%) had an abnormal X-ray suggestive of TB, and 1,372 (4.0%) TB cases were identified. The average number of dCXR screenings per month and TB positivity (i.e., people diagnosed with TB divided by people screened with dCXR) per model were 189 (10.1%) for LT-vans, 434 (3.7%) for LT-containers, and 1,366 (1.7%) for ST-vans. The average economic (financial) cost was $190 ($103) per person screened for LT-vans, $214 ($125) for LT-containers, and $240 ($148) for ST-vans, and $1,885 ($1,021), $5,761 ($3,361) and $14,157 ($8,741) per TB case identified, respectively. The extent of media engagement, demand-creation activities, staff contingents, and salaries drove cost differences.



Conclusions: While the LT-vans reached underserved rural populations, ST-vans yielded the highest monthly volume. TB test positivity was highest for the LT-van, leading to the lowest costs per person screened and per TB case identified.

EP30-992-20 Cost-effective tuberculosis diagnosis: Evaluating sputum pooling with Xpert MTB/RIF Ultra in Rwanda

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Background: This study explores the accuracy and reliability of a sputum pooling strategy using Xpert MTB/RIF Ultra to improve cost-effective TB diagnosis in Rwanda. Given the tool's high cost and the TB burden in low- and middle-income countries, the approach offers a potential solution for enhancing diagnostics in low-incidence areas.
Design/Methods: A cross-sectional study was conducted on sputum samples collected from individuals suspected TB-patients. Initially, samples were tested individually using Xpert MTB/RIF Ultra, followed by retesting the samples; each four samples pooled together following a pre-established standard operating procedure (SOP). Laboratory investigation were carried out at Rwanda National Reference Laboratory, a regional center of excellence for resistant TB diagnosis. Data were analyzed with StataSE 13 to measure and evaluate the specificity, sensitivity, negative predictive value (NPV), positive predictive value (PPV), and the cost and time savings of this pooling strategy.
Results: 1,380 sputum samples from Rwanda were included in this study. Our analysis showed that pooled testing for TB was effective, identifying 110 (7.9%) positive cases. This method had high accuracy with 97.5% agreement, 98% specificity, 90.4% sensitivity, 77.3% positive predictive value (PPV), and 99.3% negative predictive value (NPV). It also reduced costs by 41% (from 12,234 RwF to 5,013 RwF) and cut testing time by 42% (from 2.52 to 1.06 hours). A significant difference in CT values before and after pooling was found ($p = 0.00704$), though the effect size was small (Cohen's $d = 0.307$), indicating limited practical impact.
Conclusions: This study shows that the sample-pooling strategy using Xpert MTB/RIF Ultra effectively reduces testing costs and time in Rwanda, making molecular TB diagnostics more accessible. Given the country's low TB prevalence, pooling minimizes retesting, making it a practical and cost-efficient approach for community surveys targeting high-risk, asymptomatic individuals.

EP31 Everyone exposed deserves a chance: Contact investigation as a gateway to prevention

EP31-1000-20 Estimating the prevalence of tuberculosis infection in the EU/EEA: Results of feasibility assessment

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Background: The prevalence of TB infection (TBI) and subsequent risk of progression to tuberculosis (TB) disease among populations at high risk of TB in the European Union and European Economic Area (EU/EEA) is unknown, although these estimates are essential to guide targeted TB prevention interventions. To assess the feasibility of modelling country-specific estimates of TBI prevalence and progression to TB disease among at-risk populations, we examined the availability and coherence of TBI screening and TPT data in the EU/EEA.
Design/Methods: We invited national TB focal points to fill out a survey on TBI screening and TB preventive treatment (TPT) policies and practices, and data collection, including completeness and coherence of indicators for TB household contacts, migrants, persons experiencing homelessness, persons in detention, and persons with medical conditions. Survey results were scored against pre-determined modelling feasibility criteria.
Results: Of 30 invited countries, 26 provided a complete survey response. Twenty-four (92%) reported having TBI screening policies, of which 20 (83%) reported programmatic TBI screening (Table 1). Nine countries reported no systematic data collection regarding TBI testing nor TPT for any at-risk population. Data were most often collected on TB infection and/or TPT for household contacts (14 countries) and migrants (13 countries). We identified 12 countries for which modelling TBI prevalence among certain at-risk populations feasible: availability of data TB infection testing coverage and yield, disaggregated by sex, age, and country of origin with an estimated <10%

of reporting units having missing data. Main reasons why modelling was considered unfeasible were non-digitalized data, lack of data indicators, lack of disaggregated data, and fragmented and non-harmonized data collection practices.
Conclusions: Modelling of TBI prevalence and risk to disease progression estimation, which could guide implementation of targeted TPT interventions, is feasible in 12 countries. Subnational harmonization and digitalization of data collection could increase the feasibility of future TB modelling.

EP31-1002-20 'Ring Survey' - An innovative blending of active case finding and contact tracing activity under National TB Program. An insight from West Bengal, India

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Background and challenges to implementation: Contact tracing, which is the process of TB screening of the person living in same household of a Person with TB (PwTB), is in practice over the decades. Studies suggested that extra-household contacts are of similar risks of getting TB infection & active TB disease. Since 2024 the state has introduced an innovative active case finding strategy called ‚Ring Survey'
Intervention or response: Upon diagnosis of an infectious TB (microbiologically confirmed pulmonary TB), the "index case", respective health care workers visit 50 households around the index case to screen all the household contacts for TB symptoms within two weeks of the diagnosis of the index case.
Ring survey conducted elsewhere encircling an area covering 50-meter radius around index case. But the 50-meter radius might have variable number of households which makes field-operation complicated. So, the state decided to cover 50 households encircling an index case. If there are more than one index cases in same area there might be overlapping households (*Fig-1*)
Results/Impact: In 2024, total 2,335,963 households encircling 61510 index cases were surveyed. Total 7,104,650 household & extra-household contacts were screened and 289,868 presumptive TB identified & tested. Total 1,420 PwTB diagnosed. Number needed to screen (NNS) & number needed to test (NNT) was 5003 & 204 respectively. Mean age of the PwTB was 39.7 yrs (SD-17.7). 40.4% were female, 73.2% were pulmonary TB, 78.5% were bacteriologically confirmed and 1.9% were Drug-resistant TB.

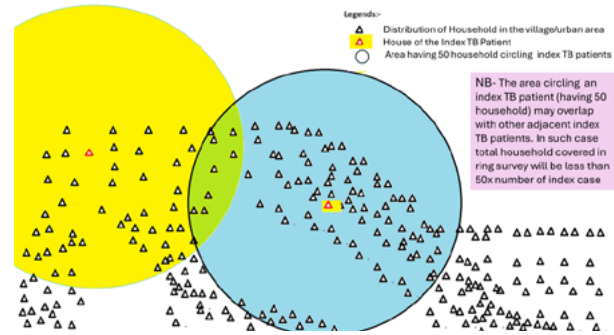

Fig-1. Guidance for house selection for Ring Survey under NTEP West Bengal.

Conclusions: Through the ring survey a higher proportion of female PwTB was detected in comparison to routine passive case findings (40% vs 30%). The overall yield of the ring survey may be further increased by conducting the survey at least twice including once at the end of treatment of the index case. This model may be replicated in other high burden areas with context-specific modification.

EP31-994-20 Uncovering the hidden threat: Contact investigation among clinically diagnosed TB cases in Lagos State

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Background and challenges to implementation: While global TB control has advanced, Nigeria remains one of the top eight contributors to the global TB burden. As per the 2024 WHO Global TB Report, over 361,000 TB cases were reported in Nigeria in 2023. However, significant gaps remain between estimated and notified cases. Traditionally, contact investigation (CI) in Nigeria excludes clinically diagnosed TB cases. The USAID TB-LON 3 project introduced a paradigm shift by including these cases in CI activities across Lagos State.
Intervention or response: From April to December 2024, CI was conducted for 1,346 clinically diagnosed TB index cases. Unlike traditional practice, these cases were systematically contact-traced. A cascade analysis was conducted using metrics such as CI coverage, screening rate,

TB yield, Number Needed to Screen (NNS), and Number Needed to Test (NNT). Preventive treatment uptake was assessed for 3HR, 6H, and 1HP regimens.
Results/Impact: Out of 1,346 index cases, 1,296 (96%) were contact traced, leading to 4,504 contacts identified and 4,506 individuals screened. Of these, 736 presumptive cases were recorded and 725 evaluated, resulting in 38 TB diagnoses (5% yield). The NNS and NNT were 119 and 19 respectively—figures comparable to those from bacteriologically confirmed cases.
Treatment enrollment stood at 95%, and 47% of eligible contacts were placed on TPT. These findings confirm that clinically diagnosed TB cases can also transmit TB and merit inclusion in CI protocols.
Conclusions: This analysis demonstrates that clinically diagnosed TB cases contribute significantly to transmission and should no longer be excluded from contact tracing protocols. A shift in policy could enhance TB case detection and accelerate progress toward TB elimination goals.

EP31-995-20 The new contact investigation model for comprehensive tuberculosis case finding by community in East Java Province, Indonesia

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Background and challenges to implementation: Indonesia still has the second highest number of Tuberculosis cases in the world. The main problem is low TB case finding. The efforts have been carried out by Household Contact Investigation (HCI), but no significant results yet. To support the government, communities can encourage increased TB case finding through innovations with a new paradigm.
Intervention or response: The New Model was Non-household Contact Investigation (NHCI). A method with a broader reach and more comprehensive considerations. The first stage was identification of index cases data (people with TB). The most important is not only family members but also various communities that interacted with people with TB (PwTB).
The second stage involved mapping the location of PwTB's house and public places in their village area (e.g., village office hall, religious meetings, schools, place of worship, neighbors).
Then, carry out HCI & NHCI by socialization and TB symptom screening. Data was collected by Bhanu Yasa Sejahtera Foundation cadres in 29 districts using the questionnaire from Jan-Dec 2024.
Data were cleaned, validated, and tabulated in Excel. A total of 58 samples were processed and analyzed in SPSS with Mann-Whitney U test comparison approach.
Results/Impact: TB case finding results from NHCI activities were higher (13,095 activities got 4,501 TB cases) than HCI (27,918 activities got 3,917 TB cases). Based on the effectiveness difference test, there was a highly significant difference with a p-value < 0.001 (r = 0.52). Replication of this program for TB case finding in other areas would be more effective with the NHCI model (Median NHCI 0.277; Median HCI 0.078).
Conclusions: NHCI is more effective and finds more TB cases than HCI. Contact investigation activities should not only focus on family members but also all residents in the area where people with TB live. This model is also projected to reduce the stigma towards PwTB found early.

EP31-996-20 Latent tuberculosis infection and life expectancy: A long-term follow-up on a cohort tested with tuberculin skin test

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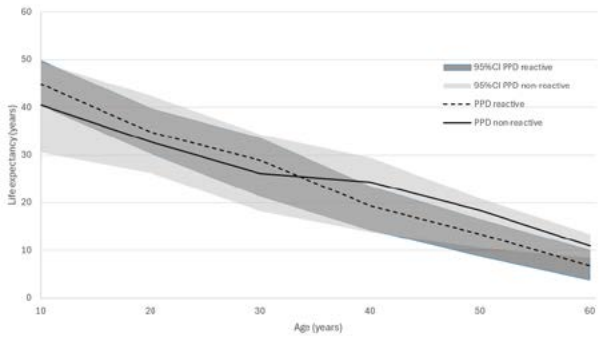
Background: One forth of the world population is estimated to be infected with *Mycobacterium tuberculosis* (Mtb) thereby representing a large reservoir from which the disease can reactivate with severe illnes and transmission as the fatal consequences. However, little is known about the lifetime consequences of tuberculosis infection (TBI) on general health besides the risk of reactivation.
Design/Methods: We conducted a restrospective follow-up study on a cohort of individuals tested with Purified Protein Derived(PPD) skin test in 1999-2000 in the capital of Guinea Bissau. The groups of PPD-reactive and -nonreactive were sought out to determine mortality during the follow-up period and to investigate subjects still alive in terms of reactivation/active Tuberculosis (TB) disease events, risk factors for TB, immunological reactivity towards Mtb and socioeconomic factors.
Results: A total of 384 (21%) individuals were identified and included. The life expectancy in the PPD-reactive group was 54 years (95%CI: 50;59), whereas it was slightly lower in the PPD-nonreactive group with a median of 50 years (95%CI: 40;59). Cox-regression analysis adjusting for age and present BCG scar yielded a hazard ratio for death in PPD-reactive of 1.06 (P=0.750), however, we found a significant interaction between age and PPD-reactivity resulting in disproportionally increasing HR for mortality in PPD-reactive and -nonreactive with increasing age. Likewise, PPD-reactivity was protective in indi-

viduals aged 0-20 years (HR: 0.32 (95%CI;0.11:0.91)) and increased the risk of mortality in individuals of 41 years and above (HR: 1.76 (95%CI;1.07:2.90)).



Conclusions: PPD-reactivity seems to be protective in children and young adults, but the effect is age-dependent and so it increases the risk of mortality in older individuals.

EP31-997-20 Enhancing TB contact investigation and TPT uptake through community volunteer engagement: Evidence from the Global Fund N-THRIP grant in Ondo State, Nigeria

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Background: Tuberculosis (TB) contact investigation and tuberculosis preventive treatment (TPT) are essential strategies for interrupting TB transmission. In Ondo State, Nigeria, low TPT enrollment prompted strategic re-evaluation during the 2024 implementation of the Global Fund Grant Cycle 7 Nigeria-TB/HIV Reach Integration & Impact Project (N-THRIP) project. This study assessed the impact of leveraging community volunteers (CVs) on TB contact tracing and TPT uptake.
Design/Methods: This retrospective quantitative analysis reviewed routine Global Fund N-THRIP program data from Q1 to Q4 2024. Contact investigation and TPT cascade data were analyzed on a quarterly basis. Descriptive statistics were used to calculate proportions, rates, and quarterly improvements. Pearson's chi-square test evaluated differences in TPT uptake and contact investigation coverage across quarters ($p<0.05$). From Q3 2024, the program adopted the engagement of community volunteers (community members sensitized through short, targeted training or frequent engagement with health workers) who were deployed to conduct health education, mobilize community participation, and raise awareness on TB prevention. CVs also supported patient follow-up and treatment adherence, contributing to sustained demand and completion of preventive therapy.
Results: Marked improvements were observed post CV engagement. Contact investigation coverage rose from 98.2% in Q1 to 100% by Q3–Q4. Under-5 TPT uptake improved from 55.9% (Q1) to 100% (Q4), while uptake among contacts aged above 5 increased from 35.0% (Q1) to 93.8% (Q4), both statistically significant ($p<0.001$).

Period	Contacts of Index TB patients identified	Contacts of index TB patients screened	TPT Eligibility (Under 5yrs)	TPT enrolment (Under 5yrs)	TPT Eligibility (Over 5yrs)	TPT enrolment (Over 5yrs)	CI Cove-rage	TPT Uptake
Q1 2024	894	894	34	19	860	301	100%	36%
Q2 2024	1,027	1,027	59	44	954	200	100%	24%
Q3 2024	1,571	1,571	78	63	1,476	1,164	100%	79%
Q4 2024	1,595	1,595	109	109	1,486	1,394	100%	94%
Grand Total	5,087	5,087	280	235	4,776	3,059	100%	65%

Conclusions: The introduction of community volunteers significantly enhanced TB contact tracing and TPT enrollment in Ondo State. Their role in raising awareness, generating demand, and supporting adherence proved invaluable in addressing key barriers to preventive care. They also offer a replicable and sustainable model for strengthening and improving TB program performance in similar high-burden, resource-constrained settings.

EP31-998-20 Long-term impact evaluation of the National Latent Tuberculosis Infection Mass Screening Program among adolescents in South Korea

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Background: In 2017, despite limited scientific evidence supporting the effectiveness of mass screening and preventive treatment (TPT) in adolescents with an extremely low risk for active TB progression, the South Korean government launched a national latent tuberculosis infection

(LTBI) mass screening program for high school students to identify LTBI cases and provide TPT. The study's objectives:(1)To assess the impact of LTBI mass screening and TPT on reducing active TB disease in low-risk groups;(2) To examine how factors such as socioeconomic position (SEP) and gender modify the active TB incidence based on the LTBI screening status.

Design/Methods: A retrospective cohort study analyzed data from 1,122,933 high school students (ages 15–19) from 2017 to 2022. TB incidence was compared between an intervention group (screened for LTBI) and a control group. Cox proportional hazards models and Kaplan-Meier survival analyses estimated the effects of LTBI screening and TPT, stratified by gender and SEP.

Results: Kaplan-Meier survival curves showed minimal differences between the control and intervention groups (Figure). After adjusting for household income, disability, diabetes, and vitamin D deficiency, the hazard ratio for TB incidence was higher in men than women (HR: 1.30, 95% CI: 1.08–1.56). The effect modification analysis indicated that participants with low SEP in the intervention group and high SEP in the control group had a 39% higher TB risk than the reference group (ERR: 0.40, 95% CI: 0.05-0.865, p = 0.022).

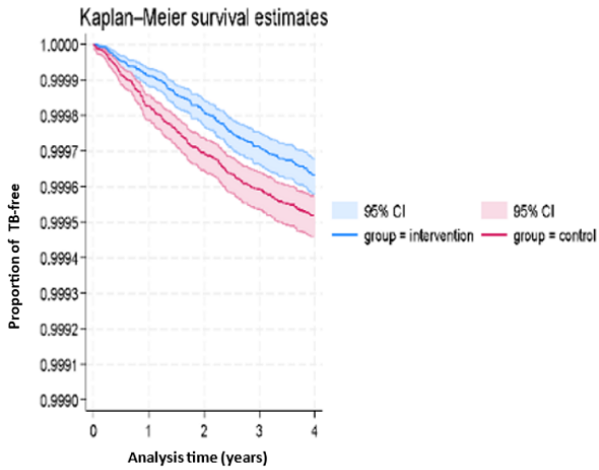

Figure. *Survival function estimated of overall control and intervention groups using the Kaplan-Meier methods, adjusted for household income, disability, diabetes mellitus, and vitamin D deficiency.*

Conclusions: This study suggests that South Korea's LTBI mass screening program had limited impact on ending TB in low-risk groups. The findings highlight that implementing mass screening and treatment in such populations may not yield meaningful public health benefits. Instead, it emphasizes the need for targeted approaches addressing gender and SEP disparities to enhance TB prevention and care, emphasizing that reducing active TB transmission may be more effective than mass screening.

EP31-999-20 Factors associated with 28-month TB incidence after isoniazid-rifapentine (3HP) among Ugandan adults with HIV

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Background: The World Health Organization recommends weekly isoniazid-rifapentine (3HP) for tuberculosis (TB) prevention in people living with HIV (PLWH). The durability of protection afforded by 3HP in high-burden TB/HIV settings remains unclear.

As part of a randomized, pragmatic implementation trial of 3HP, we aimed to determine TB incidence over 28 months and factors associated with incident TB.

Design/Methods: Adult PLWH at an HIV clinic in Kampala, Uganda, received 3HP through facilitated directly observed therapy or facilitated self-administered therapy (SAT).

Participants were followed for at least 28 months from the initiation of treatment to determine TB status. Unadjusted competing risks survival regression models were used to assess for individual demographic and clinical factors associated with TB incidence, with all-cause mortality as a competing event.

Results: Between July 2020 and July 2022, 1655 PLWH were enrolled, and 1651 initiated treatment (median age 42 years; 68% female; 44% SAT; 94% completed treatment).

Participants contributed 4385 person-years (py) of follow-up after treatment initiation, during which 13 participants (0.8%) developed active TB and 13 (0.8%) died. The TB incidence rate was 2.97 episodes per 1,000 py (95% confidence interval, CI: 1.72-5.11).

Receiving 3HP via SAT (sub-hazard ratio, SHR: 7.05, 95% CI: 1.59-31.32, $p = 0.01$) and being male (SHR: 3.33, 95% CI: 1.10-10.12, $p = 0.03$) were associated with an increased risk of incident TB, whereas 3HP treatment completion (SHR: 0.22, 95% CI: 0.06-0.80, $p = 0.02$) was associated with a reduced risk of incident TB (Table 1).

Characteristic		TB Cases/PY, Rate/1000 PY (95% CI)	SHR (95% CI)	P Value
Sex	Female	5/2978, 1.65 (0.69-3.96)		
	Male	8/1407, 5.58 (2.79-11.15)	3.33 (1.10-10.12)	0.03
Study arm	DOT	2/2458, 0.80 (0.20-3.19)		
	SAT	11/1927, 5.61 (3.10-10.12)	7.05 (1.59-31.32)	0.01
3HP treatment completion	No	3/266, 11.09 (3.58-34.39)		
	Yes	10/4119, 2.38 (1.28-4.43)	0.22 (0.06-0.80)	0.02

PY = person-years; Rate = Crude TB incidence rate; SHR = sub-hazards ratio; SAT = self-administered therapy; DOT = Directly Observed Therapy

Table 1. Factors associated with 28-month TB incidence after one course of 3HP among adult people living with HIV in Uganda.

Conclusions: The 28-month incidence of TB was low among PLWH who received a single course of 3HP for prevention, suggesting that repeat 3HP administration is not needed within this period. Programs should focus on ensuring high adherence and treatment completion, particularly for self-administered therapy.

EP32 Building capacity in systems and people to deliver person-centred care

EP32-1003-20 Empowering health staff in the peripheral states of Himachal Pradesh and Odisha for better TB data management under national TB Elimination Program, India

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Background and challenges to implementation: Optimal tuberculosis (TB) data quality management is crucial in high-burden countries like India. Despite availability of Ni-kshay, a real-time TB management information system, decision-making is often hindered by limited data analytic skills of the National TB Elimination Program (NTEP) staff. The Expand ELEVATE (Engaging Local Experts for Validating and Analyzing TB data to End TB in India)(E2) project in Himachal Pradesh and Odisha aimed to address the above issue.

Intervention or response:

Figure-1: pictures of capacity building at Una district and screenshot of AV shared by the state

In 2022-23, the E2 project trained 94 sub-district staff from 6 and 2 districts in Himachal Pradesh and Odisha respectively on accessing data from Ni-kshay portal, preparation, analysis and data visualization using MS Excel. During 2022 to 2024, mentoring visits and virtual training sessions were conducted and hands-on support provided, including key program indicators (KPI) analysis and action plan development. In May 2024, E2 project recorded and circulated four audio-visual materials in local-language on data analytics and usage of Ni-kshay

for staff use. Based on project advocacy, NTEP mandated monthly KPI analysis by sub-district staff, with oversight from district staff for accountability.

Results/Impact: By 2024, trained sub-district teams began independent data analyses. Additionally, in Himachal Pradesh, their independent data analysis improved data quality and saved 2.5 person-days per month, earlier being spent on analytic tasks. By Q4 2024, 32% (30 of 94) of staff shared their newly acquired skills with peers, addressing gaps and improving 67% (37 of 55) of identified KPIs across both states. The states found the intervention beneficial, advocating for geographic expansion, and ongoing staff training in data analytics.

Conclusions: The initiative improved efficiency of sub-district staff in data analytics for timely and decentralized decision-making, fostered a culture of data use, accountability and made available time for other programmatic activities. This initiative has demonstrated a sustainable peer-training approach and thereby contributing to health system strengthening.

EP32-1004-20 Accelerating eCBSS access and utilisation to enhance TB/HIV program implementation through multifaceted, district-led quality improvement initiatives in mid-Western Uganda: The Bunyoro region success story!

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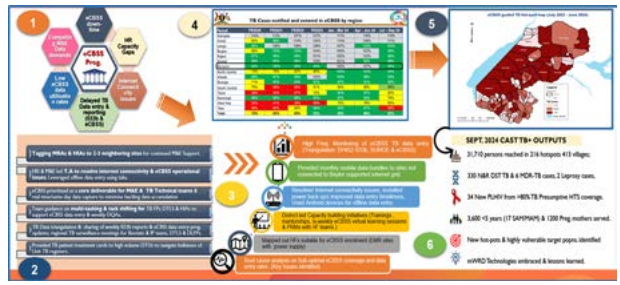
Background and challenges to implementation: In 2020, Uganda's Ministry of Health launched eCBSS to improve TB and leprosy case management. Built on DHIS-2, it integrates with existing data streams, supports offline capture, and enables real-time data entry via Android devices, enhancing efficiency and care. Bunyoro struggled with poor outcomes due to data gaps. A root cause analysis identified limited human resources and poor internet connectivity as key barriers to optimal system performance.

Intervention or response: Using a CQI approach, Baylor Foundation Uganda, MoH, HISP, and district local governments implemented collaborative interventions to improve TB DTU-eCBSS coverage and utilisation. We mapped eligible HFs, focused on district-led QI capacity building, and trained regional trainers, Biostatisticians, DTLS, IP, and 10 high-volume DTU staff. TOTs trained 87 additional DTUs; MRAs & HIAs were tagged to 2–3 nearby sites for cost-effective M&E; supported offline data entry via phones/tabs; facilitated staff performance monitoring, multi-tasking, and task shifting for real-time data entry; conducted weekly DQAs; integrated eCBSS into TB surveillance meetings; provided TB client cards, power backups, and monthly data bundles to sites without IP-supported internet.

Results/Impact: Bunyoro region made significant progress, with DTU coverage increasing from 9% (10/114) in 2020 to 85% (97/114) in September 2024. 21 newly accredited DTUs to be enrolment in 2025, and the eCBSS-TB data entry rate is 95%. CAST+ TB case finding improved by 30%, from 230 (March 2024) to 330 (Sept. 2024), driven by eCBSS-guided hotspot mapping, and the cost of the CAST TB+ campaign dropped from $150 to $30 per patient.



Conclusions: District-led eCBSS continuous quality improvement (CQI) initiatives are key to scaling up the program and enhancing data use. Timely data entry and backlog clearance enable effective TB hotspot mapping and patient monitoring, improving outcomes. By increasing efficiency in TB/HIV program implementation, eCBSS strengthens surveillance and response, with continued investment promising greater data-driven public health impact.

EP32-1005-20 Evaluating the contributions and challenges of community pharmacies and over-the counter medicine shops in tuberculosis case detection and treatment initiation in Ghana

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Background and challenges to implementation: In Ghana, individuals with persistent cough often seek initial care from over-the-counter medicine sellers (OTCMS) rather than formal health facilities, leading to missed opportunities for early TB detection. To address this, the National TB Programme (NTP), through the Public–Private Mix (PPM) intervention, engages OTCMS to screen and refer people with presumed TB symptoms. This intervention aims to strengthen community-level surveillance, expand case detection beyond the formal health system, and ensure timely linkage to diagnostic and treatment services.
Intervention or response: Aurum institute Ghana and the Ghana National TB Voice Network trained staff in 80 selected sites from 4 regions (Western, Ashanti, Greater Accra and Northern) on the use of the revised NTP TB symptom screening tool. The intervention trained 42 TB Champions to assist the pharmacies & OTCMS in screening and sample transportation. Samples of presumed clients were transported to testing hubs and follow-ups were done by TB Champions. All bacteriologically diagnosed clients were referred into care and initiated on treated. Contact tracing of index clients was done and eligible contacts were enrolled on TB treatment preventive therapy (TPT). The data for this intervention was collected from April 2024 to February 2025.
Results/Impact: A total of 13,523 individuals were screened, 4,672(34.5 %) were identified as presumptive TB cases. About 2,748(58.8%) sputum samples were collected and tested. Out of the 2,748 samples tested, 98(3.6 %) were bacteriologically confirmed positive and 3 clinically diagnosed. 98(97%) individuals were successfully initiated on TB treatment. This represents a high treatment initiation rate.
Conclusions: The engagement of pharmacies & OTCMS in TB screening under the Global Fund GC7 intervention proved to be an effective strategy for improving early TB detection and treatment initiation in Ghana. The approach leveraged the accessibility of community pharmacies & OTCMS to bridge gaps in TB case detection and advanced timely referrals for diagnosis and care.

EP32-1006-20 Improving tuberculosis knowledge among community health cadres through national training: Evidence from pre- and post-test evaluation in 229 districts in Indonesia

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Background and challenges to implementation: Community health cadres play a crucial role in TB control in Indonesia, particularly in contact investigation (CI) and tuberculosis preventive treatment (TPT). In 2025, a nationwide training was implemented to strengthen cadres' capacity, involving 5,230 participants over a two-day session covering five key modules: Basic TB Information, Integrated CI-TPT, Community Outreach, Communication, and Recording and Reporting.
Intervention or response: The study aimed to evaluate the effectiveness of this training program in enhancing participants' knowledge and comprehension across the five core competency areas through a pre- and post-training assessment.
The study aimed to evaluate the effectiveness of this training program in enhancing participants' knowledge and comprehension across the five core competency areas through a pre- and post-training assessment.
Results/Impact: Results revealed an overall knowledge improvement of 15.01%, with the mean score increasing from 74 in the pre-test to 85 in the post-test. The greatest gains were observed in CI and TPT-related questions—for instance, a 20% increase in correctly identifying the source of index cases. Despite these positive outcomes, some areas showed persistent gaps. Understanding of the roles of community health cadres and treatment supervisors (PMOs), as well as certain documentation procedures, remained suboptimal. The lowest post-test performance was 64% correct on questions regarding patient monitoring forms. In the two months following the training, cadres screened 236,195 household contacts and high-risk groups (HRG), leading to the detection of 83,306 TB cases and over 6,000 HRG individuals commencing TPT. Key challenges included reluctance of contacts to visit health facilities and limited access to diagnostic services.
Conclusions: The national TB cadre training program significantly improved participant knowledge, particularly in CI and TPT. Nonetheless, targeted reinforcement in cadres' roles and reporting procedures is warranted. Continuous mentoring and periodic refinement of training modules are recommended to further strengthen cadre competencies and support TB control efforts.

EP32-1007-20 Enhancing tuberculosis case manager training through leader-guided discussions in Taiwan

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Background and challenges to implementation: Training for tuberculosis case managers (TCMs) in Taiwan includes initial training (IT) for foundational knowledge and refresher training (RT) to enhance practical skills through small group discussions. Previously, discussions were self-directed with occasional support from a senior TCM. In 2023, experienced TB case managers led each group, introducing a reward system to incentivize performance. This study explores the transition from loosely facilitated to leader-guided discussions and its impact.
Intervention or response: Semi-structured interviews were conducted with nine senior case managers who served as counselors before 2022 and discussion leaders after 2023. The interviews were transcribed and analyzed using thematic analysis to identify key patterns and insights.
Results/Impact: Analysis showed that pre-2022 discussions lacked structure due to absent leadership, often leading to disorganized sessions. Post-2023, the introduction of senior case managers as leaders significantly improved discussion effectiveness.
Some leaders encouraged quieter participants to share experiences, facilitating meaningful engagement even for those less familiar with TB. However, some leaders focused on preparing presentation slides with a few experienced members to win rewards, rather than facilitating the group as a whole.
While the reward system motivated participation, it also led to dominance by experienced participants, undermining group balance.
Conclusions: The study highlights the critical role of leadership in effective group discussions and the need for consistent standards and teaching objectives among leaders. It suggests that leaders should evolve towards facilitators, encouraging broad participation beyond directing content. Revising the reward system and training leaders in facilitation techniques are recommended to maximize benefits for all trainees. Future research could explore the long-term impacts of these changes on training outcomes.

EP32-1010-20 Pathways to enhance presumptive TB examination rate (PTER)/100,000 population and its impact in TB cases notification in the state of Uttar Pradesh (UP), India

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Background and challenges to implementation: UP, the largest State of India contributes to 16% of the country's population and 22% of its TB case notification. The Central TB Division (CTD), Ministry of Health & Family Welfare, Government of India in 2022 estimated the state's TB incidence rate of 265 (233–307) per100,000 population which translates into 1.07 million people with TB. In 2022, the state notified 0.517 million. To enhance the TB detection, the state set a Presumptive TB Examination Rate (PTER) target of 2,000 per 100,000 population by 2024.
Intervention or response: Evidence indicated that 64% of individuals with TB symptoms did not seek care from a qualified doctor. State adopted three pathways to enhance PTER. 1) Screening of Individuals with TB symptoms at Ayushman Arogya Mandirs (AAM), the Sub centers, which are managed by Community Health Officers 2) Enhance private sector engagement through patient provider support agencies (PPSA), that engage with private healthcare facilities to improve TB notification and public health actions and 3) Enhance TB screening and testing among out-patient attendees in public health facilities to 5%. With the guidance from the State TB Program, India Health Action Trust (IHAT) developed guidelines, conducted training, established systems for specimen transportation to laboratories, monitored progress and generated evidence for the state to take actions to improve performance.
Results/Impact: The PTER increased from 801 (2022) to 1298 (2023) to 2196 (2024). TB case notification increased from 0.519 million (2022), to 0.623 million (2023) to 0.681 million (2024); resulting in increase in Annual TB Case Notification rate from 218 (2022) to 260 (2023) to 270 (2024); approaching the CTD 2022 estimated TB incidence rate of 265 (233–307)/100,000.

Years	2022	2023	2024
Presumptive TB Examination Rate (PTER)/100,000 Population	801	1298	2196
Notification of TB cases Every Year	5,18,126	6,23,210	6,82,275
Case Notification Rate (CNR)/100,000 Population	218	260	270

Data Source India TB Report 2023, Annexure M, Lab Reports 2023 and 2024 and Ni-kshay Dashboard)

Conclusions: Elimination of TB is only possible if there is increase in PTER. Enhancing PTER using critical patient pathways resulted in increased TB case notification in the State of Uttar Pradesh India.

EP32-1011-20 Kanniq, a confluence of rivers: Inuit determine how lay public health workers can lead the transformation towards person-centered TB care in Nunavik, Quebec, Canada

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Background: Nunavimmiut—Inuit indigenous to Nunavik (in Quebec, Canada)—face tuberculosis rates over 150-times the provincial average of Quebec. Colonial legacies and healthcare inequities fuel this disparity. Nunavimmiut are actively reclaiming self-determination over public services. Within a predominantly non-Inuit healthcare workforce, new Public Health Officer (PHO) positions aim to increase Inuit presence. This study identified PHO roles that will effectively address Nunavimmiut tuberculosis needs.
Design/Methods: A community-based participatory action research project working with Nunavik's health authorities, leaders, and an Inuit steering committee. Indigenous researchers (First Nations & Nunavimmiut) conducted interviews and focus groups with Nunavimmiut about tuberculosis and healthcare experiences. Iterative data analyses used constructivist grounded theory and Indigenous Research Methodology within a reconciliation framework, considering service delivery challenges observed in outbreaks occurring during the research. PHO roles were mapped from identified needs.
Results: From 2022-2023, we interviewed 156 Nunavimmiut (71 interviews, 33 focus groups) in 5 Nunavik communities and Montreal. While experiences varied, key hardships arising from tuberculosis services included feeling uninformed, discrimination and cultural/language barriers in healthcare, disruptive displacement for screening and diagnosis, vulnerability during isolation, financial strain, stigma, and logistical challenges of clinic-based directly observed therapy. Support for greater Inuit representation in care was widespread. Observations pointed to PHO roles that prioritize fostering understanding of tuberculosis and its cascades of care; identifying individual/family needs and expected challenges (including logistical, material, social) that health services should address through supportive measures; and leading activities to enhance community engagement in tuberculosis care and destigmatization. Lack of space and resources, challenges in translating medical terminology, uncertainties around training, and healthcare worker unfamiliarity with PHO roles were identified as implementation challenges.
Conclusions: Nunavimmiut endorse having PHOs in tuberculosis care. PHO roles should prioritize ensuring health services provide culturally relevant informational, social, and material support to individuals and families aligned with person-centered care.

EP32-1012-20 Local action for global goals: A tuberculosis education project in southern Brazil

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Background and challenges to implementation: Tuberculosis (TB) remains a persistent global public health challenge, particularly in countries with significant social and economic disparities. In response, the Brazilian Ministry of Health launched the "National Plan to End Tuberculosis as a Public Health Problem," which was subsequently adapted by the state of Paraná into its own "State Plan to End Tuberculosis." These plans emphasize the importance of health education, capacity building, and effective surveillance at the local level as key strategies for eliminating TB. In this context, a university extension project was developed to support the training of healthcare professionals across the state.
Intervention or response: The project began with internal planning meetings and team training, followed by the development of structured educational interventions. Training for healthcare workers focused on the clinical management and epidemiological surveillance of TB, utilizing lectures, interactive workshops, group dynamics, and case-based discussions. Educational tools such as di-

agnostic and treatment flowcharts and a treatment monitoring card were designed to support daily practice. To promote community awareness, accessible materials were produced, including interactive banners with QR code access and a puppet theater targeting children.

Results/Impact: A total of 14 training sessions were conducted: four in Regional Health Units, nine in Basic Health Units, and one in a public square in Maringá. Approximately 200 individuals participated, with Community Health Agents and Endemic Control Agents representing the largest share, followed by nurses and physicians.

Conclusions: This extension project contributed meaningfully to TB care efforts in Paraná by enhancing the capacity of frontline health professionals. By fostering knowledge translation into practice, the initiative aligns with the broader public health objective of eliminating TB as a public health threat through integrated and community-based approaches.

EP32-1013-20 Integrated TB-mental health services in Nigeria: A task-shifting model for underserved communities

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Background and challenges to implementation: Nigeria is among the 30 high TB, TB/HIV, and drug-resistant TB burden countries. Additionally, Nigeria has a high prevalence of mental disorders, with depression and substance use disorders being major public health concerns. Although studies have shown that there is a strong relationship between TB and depression, little has been done to address the mental health challenges of TB patients in Nigeria. This is probably because there's shortage of mental health experts in the country. The Psychiatrist to population ratio is 1:1,000,000.

This project implemented a community-facility task-shifting model to bridge gaps in TB-depression-substance use disorder care.

Intervention or response: Over 18 months, 131,820 persons were screened across 10 LGAs using Community Health Workers and facility-based screening officers trained in PHQ-9/ Alcohol, Smoking and Substance Involvement Screening Test. Mental health providers were trained using the WHO-mhGAP. While lay counselors provided basic mental health services at the community level, non-specialist health workers provided counselling as well as pharmacotherapy in the facilities. Referrals were made to mental health experts for severe cases. Data were analyzed for yield, treatment linkage, and operational challenges.

Results/Impact: TB-Depression Comorbidity: 1 in 2 diagnosed TB cases (832/1,666) had depressive symptoms.

- TB-SD Comorbidity: 1 in 5 diagnosed TB cases (385/1,666) had substance use disorder
- Community Integration: 20 lay counsellors provided mental health services to 150(95%) out of the 158 TB patients who had depressive symptoms and 66 (87%) out of the 76 who had SD.
- Facility Integration: 48 health workers provided mental health interventions for 593 (88%) of TB/Depression and 275(89%) of the 309 TB/SD cases at facility level.

Conclusions: Task-shifting to lay counselors and non-specialist health workers improved access to integrated care. Policy implications include scaling simplified screening tools and embedding mental health into national TB programs.

EP33 Characterising the drivers and impacts of TB- related stigma across different contexts

EP33-1014-20 Toward a conceptual understanding of intersectional stigma and resilience in DRTB-HIV coinfection

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Background: South Africa has the world's largest DRTB-HIV syndemic. Affected people encounter multilevel challenges, including external and internal stigma. We explored intersectionalities in DRTB-HIV stigma to conceptualize interventions.
Design/Methods: Qualitative research was nested into a trial aimed at improving adherence to all-oral treatment regimens among adults with DRTB-HIV in Durban. From April 2019-April 2020, in-depth interviews were conducted with ~10% of trial participants reporting extreme stigma scores (<7 and >12) on a study-derived stigma measure. Stigma and intersectionality theories supported thematic analysis.
Results: Fourteen consenting participants (24-48 years, 57% women) completed interviews; 12 lived in informal settlements, 6 had primary education only, and 6 had adherence challenges. All had lived with HIV prior to DRTB. Participants felt stigmatized from both conditions but revealed unique drivers, impacts, intensities, and capacities to resist each. External DRTB stigma, driven by fear of infectiousness, manifested as physical separation and ostracization within homes, communities, clinics and workplaces, and diminished emotional and material support. External HIV stigma, driven by mistrust and assumed wrongdoing, manifested as teasing, gossiping, and partner rejection. Internal stigma was attributed to DRTB, driven by repeat mistreatment, guilt, lost productivity, and treatment pessimism; leading to embarrassment, social withdrawal, and mental distress. Stigma experiences were compounded by poverty and fraught gender-relations. Positive treatment responses and guarded disclosures (sharing TB over DRTB or HIV) helped participants to resist dominant drivers of stigma. Time, diagnosis acceptance, and personal priority-setting built resilience. Longer life-experiences with HIV and ART stability enabled many participants to deflect and develop resilience to HIV stigma.

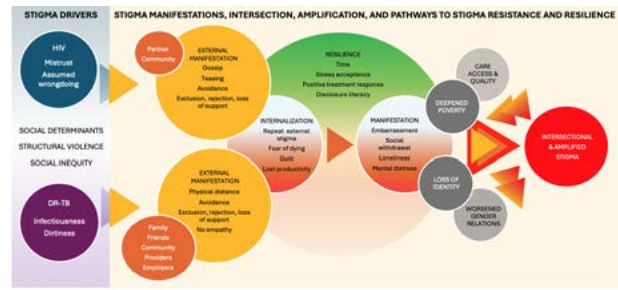

Figure. Heuristic representation of intersectional stigma in people with DRTB and HIV

Conclusions: The confluence of stigmas related to DRTB and HIV provokes amplified, intersectional stigma in people affected by both. Positive messaging supporting DRTB-HIV treatment and recovery, psychosocial assistance addressing prevailing inequities, and people-centered approaches to DRTB notification, disclosure and isolation may alleviate stigma, and potentially enable adherence and mental well-being.

EP33-1015-20 The landscape of TB stigma in Nepal: Contextual evidence of stigma levels, manifestations, and experiences among people with TB

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Background: An estimated 69000 Nepali people develop tuberculosis (TB) annually, yet only half are diagnosed and treated in government system. TB-related stigma represents a significant barrier contributing to this diagnostic gap. Nepal's unique and complex traditional culture complicates stigma research due to societal constructs and diverse ethnic interpretations of disease causation. We explored culturally diverse manifestations, experiences, and levels of stigma among people with TB.
Design/Methods: From March to December 2024, we conducted a cross-sectional study across six districts in Nepal. We interviewed 60 individuals with TB (equal male/female) in intensive treatment phase from high TB

notification DOTS centers and analysed stigma levels and manifestations using Stop TB Partnership's validated TB-stigma assessment tool. Open-ended responses were transcribed, translated, and analysed thematically.

Results: The study cohort (n=60) included 75% (45/60) participants aged 25-64 years predominantly from rural poor communities. The cohort's stigma level was 69%. The majority experienced self-stigma, manifested as keeping their distance from others (58/60;97%), selective disclosure (55/60;92%), and guilt (49/60;82%). Participants experienced feeling hurt by others' reactions (53/60;88%), losing friends after disclosure (52/60;87%), and experiencing loneliness (45/60; 75%).

Qualitative findings revealed gender-independent enacted stigma manifested through physical distancing and separation of personal items within households, resulting in reduced communication, isolation, and emotional distress. Anticipated stigma led to fear of social discrimination, job loss, and selective disclosure outside the family. Following disclosure, participants reported experiencing hatred, family and friend abandonment, education disruption, and employment termination. Females of all ages commonly mentioned social rejection from neighbors and reduced family care.

Conclusions: TB-related stigma is highly prevalent among people with TB in Nepal, causing negative psychosocial impacts. People with TB face stigmatization from family and community members. Integrating peer support mechanisms, such as TB clubs and family-centered counseling, into national TB program could mitigate stigma and improve timely TB diagnosis and care.

EP33-1016-20 Tuberculosis stigma and health-seeking behavior: Results from the 2022 Nairobi, Kenya tuberculosis prevalence survey

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Background: Interventions to reduce tuberculosis (TB), including active case-finding, require an understanding of the population distribution of TB stigma. The impact of stigma on the TB care cascade is complex and incompletely understood.

Design/Methods: We conducted a cluster-based TB prevalence survey in 2022 among adults in nine communities of Nairobi, Kenya. TB stigma was defined as endorsing any of the 10 stigma attitudes in a validated TB stigma questionnaire. Participants were screened using WHO 4-symptom screening for TB (W4SS) and asked about health seeking behaviors. Multi-level logistic regression models including a random variable at the community level were used to determine correlates of individual TB stigma. Logistic regression models were used to determine association between individual, household, and community-level stigma and individual health seeking behavior.

Results: Of 6366 surveyed individuals, 1631/6366 (25.6%) reported any TB stigma, and community prevalence of TB stigma ranged from 20.4-43.2% (chi-squared test p-value <0.001). In a model adjusted for demographic/clinical variables significantly associated with TB stigma in uni-variable analysis, individual TB stigma was associated with younger age (odds ratio (OR) 0.97 (0.97-0.98), p<0.001), female sex (1.16 (1.00-1.33), p=0.047) and HIV-status (1.86 (1.21-2.87), p=0.005).

Among individuals reporting ≥1 W4SS symptom, higher community-level prevalence of TB stigma was associated with higher odds of seeking health care (adjusted OR 1.37 (1.05-1.77), p=0.018) (per 10% increase in community TB stigma prevalence) (Table 1). Individual and household TB stigma were not significantly associated with health seeking behavior.

	OR	p-value	aOR†	p-value
Individual TB stigma	1.20 (0.79-1.83)	0.392	1.18 (0.77-1.82)	0.453
Household TB stigma‡	1.03 (0.98-1.08)	0.310	1.02 (0.97-1.08)	0.415
Community TB stigma‡	1.29 (1.00-1.66)	0.052	1.37 (1.05-1.77)	0.018

Individual TB stigma was defined as an individual who reported any of the surveyed TB stigma attitudes.
Household TB stigma was defined as frequency of individuals in a household reporting any of the surveyed stigma attitudes.
Community TB stigma was defined as frequency of individuals in a community reporting any of the surveyed stigma attitudes.
*W4SS symptoms are cough, night sweats, fever, and weight loss
†Adjusted for correlates of TB stigma (age, sex, HIV-status)
‡Reported per 10% increase in frequency of TB stigma per household/community

Table 1: Logistic regression analysis to determine associations between TB stigma at the individual, household, and community levels, and likelihood of health seeking behavior among individuals reporting ≥1 WHO 4-symptom screening for TB (W4SS) symptom (n=1121).*

Conclusions: Within a high-TB prevalence, urban environment, TB stigma was common, differed in frequency across communities, and correlated with social and demographic factors. We found an association between increased community-level TB stigma and health seeking behavior, suggesting a complex interplay between TB stigma and gaps in TB diagnosis, and supporting further investigation into the impact of TB stigma on the care cascade.

EP33-1017-20 Stigma's dual shadow: TB-HIV misconceptions affect patients and health workers in West Nile, Uganda

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Background: West Nile, Uganda, bears a high TB burden compared to the national average. To compound this, TB-HIV stigma persists, affecting both patients and health workers (HCWs). We explored the magnitude and effects of TB stigma in Zombo district to guide interventions.
Design/Methods: We conducted a cross-sectional survey of 275 people with or who had TB (PWTB) (177 pulmonary TB, 89 unknown type) and 47 HCWs in Zombo district. Using the Van Rie Self-Stigma Scale (0–4: strongly disagree to strongly agree). PWTB item A7 ("I am afraid to tell others I have TB because they may think I also have HIV/AIDS") and HCW items (e.g., A1: "nervous about treating TB patients") were analyzed for prevalence, mean scores, and care inhibition using Stata V.17. Self-stigma scores (max 48) and agreement rates (≥3) were used to assess the impact of stigma on TB care access and service delivery.
Results: Among PWTB, 42.5% (117/275) feared disclosing TB due to perceived HIV/AIDS stigma (mean 0.34, SD 0.81), exceeding clinic avoidance (16.7%) and family disclosure fears (25.5%). Self-stigma averaged 25.1; 36.4% scored high. Men (45.3%) and ages 25–44 (44.7%) showed the highest agreement (p=0.14). Care inhibition was low (9.1%), suggesting internalized stigma.
Only 7.6% were HIV-positive, indicating TB stigma's independence. Among HCWs, 76.6% (36/47) felt nervous treating TB patients (mean 0.77), with 48.9% facing stigma, especially in clinics (36.2%). Nurses (52.9%) reported higher stigma than doctors (35.7%).
Conclusions: Stigma linking tuberculosis to HIV/AIDS drives patient fears, prioritizing secrecy over openness, yet not deterring care. Healthcare workers, especially nurses, who are a critical cadre in TB management, face stigma that erodes confidence in TB care. Tailored educational initiatives and specialized training must address misconceptions to promote stigma-free, confident care in high-burden settings.

EP33-1018-20 Assessing the impact of stigma on access to TB services in Zimbabwe

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Background: Tuberculosis (TB)-related stigma is a critical barrier to accessing healthcare services, adherence to treatment, and overall well-being of people with TB (PWTB). This study aimed to assess the extent and sources of stigma inhibiting access to TB services among PWTB in Zimbabwe. The assessment sought to identify key stigma-related barriers and inform targeted interventions.
Design/Methods: A nationally representative cross-sectional survey was conducted, involving 416 PWTB from diverse settings across Zimbabwe. Data were collected through structured interviews using a standardized TB stigma assessment tool. The survey measured stigma in various domains, including self-stigma, stigma within families, communities, workplaces, and healthcare facilities. Descriptive and inferential statistical analyses were performed to quantify stigma prevalence and its association with service utilization barriers.
Results: Findings revealed that stigma in the community (22%) was the most significant barrier to accessing TB services, followed by self-stigma (10%) and stigma within the family/home (10%). Workplace stigma (6%) and stigma in healthcare facilities (5%) were also reported, albeit at lower levels. The cumulative impact of these stigmas contributed to delays in seeking diagnosis and treatment, social isolation, and reduced adherence to TB care protocols.
Conclusions: TB stigma remains a significant impediment to service uptake in Zimbabwe, particularly at the community level. Targeted interventions, including community awareness campaigns, healthcare provider training, and psychosocial support for PWTB, are recommended to mitigate stigma and improve health outcomes. Addressing self-stigma and family-level discrimination through counselling and peer support groups can further enhance treatment adherence and reduce TB-related suffering. The findings underscore the urgent need for stigma reduction initiatives within national TB programs.

EP33-1020-20 Healthcare providers' perception of tuberculosis-related stigma: Drivers and manifestations within Nepal's cultural contexts

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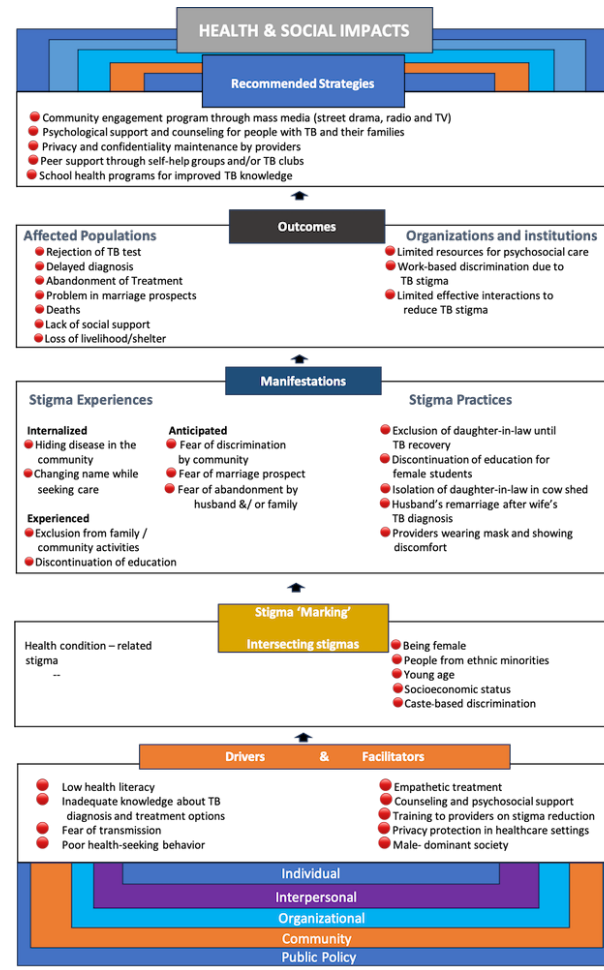
Background: An estimated 69,000 Nepalis develop tuberculosis (TB) annually, yet only half are diagnosed and treated in government system. TB-related stigma represents a significant diagnostic barrier, complicated by Nepal's unique cultural interpretation of disease.
This study explored culturally diverse stigma drivers, manifestations, experiences, and outcomes from healthcare providers' perspectives.
Design/Methods: Between March and December 2024, we conducted a cross-sectional qualitative study in six districts of Nepal. Using semi-structured guides, we interviewed 20 community TB care providers and explored stigma manifestations, gender and ethnic variations, and impact on diagnosis and care.
Audio-recorded interviews were transcribed, translated and thematically analysed. The results were mapped using the health and stigma framework domains: Drivers, facilitators, marking, manifestations, and outcomes.
Results: TB stigma was driven by poor socioeconomic conditions and social disparities. Positive facilitators for reducing stigma included provider training on stigma identification and reduction, psychosocial counseling to people with TB and family members, confidentiality maintenance, and community campaigns in local language.
Gender and ethnic minority status intersected with TB stigma, manifesting as internalized stigma–disease concealment, name and identity changes for TB registration; anticipated stigma– fear of family and/or community abandonment.
Discriminatory practices were reported by females with TB, especially younger individuals, such as discontinuation from education, being sent to paternal homes, isolation in cow sheds, and marriage difficulties, leading to test refusal, delayed diagnosis, and deaths. Males experienced better outcomes partly due to mobility autonomy, facilitating improved access to diagnosis and care.
Conclusions: TB stigma was perceived to be driven by and intersected with sociocultural factors among people with TB in Nepal, disrupting access to TB diagnosis and care. The results show that people-centered support interventions such as psychosocial counseling, peer support for people with TB and family, and gender-sensitive TB care are required to overcome TB stigma and improve timely TB diagnosis and care.



EP33-1021-20 Manifestations of stigma related to unhealthy alcohol use and its impact among people with tuberculosis or HIV coinfection in Pune, India

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Background: Stigma negatively affects the treatment of Tuberculosis (TB), HIV, and unhealthy alcohol use (UAU). Although UAU often co-occurs with TB and HIV, little is known about the stigma faced by people with TB or HIV coinfection (PWTB/HIV), and how health providers (HPs) and community perceive PWTB/HIV with UAU. Our study qualitatively examines stigma manifestations of UAU among PWTB/HIV and its effects on their psychological well-being, using the Health Stigma and Discrimination Framework by Stangl et al. (2019), which classifies stigma manifestations into stigma experiences (perceived, experienced, and self-stigma) and practices (prejudices and discriminatory behavior).

Design/Methods: Between March and August 2021, 3 focus group discussions (FGDs) with HPs from TB/HIV clinics and 20 in-depth interviews (IDIs) with PWTB/HIV, their families, and senior HPs from TB/HIV clinics were conducted in Pune, India. FGDs and IDIs were audio-recorded, transcribed, translated, and analyzed in MAXQDA using thematic analysis.

Results: We conversed with 33 HPs (24 males, 9 females), 12 PWTB/HIV with UAU (11 males, 1 female), and 5 family members (3 males, 2 females). Key findings included: *Perceived Stigma:* PWTB/HIV and their families, reported fears of discrimination and alienation from society, and their HPs associated with diagnosis of UAU. *Experienced Stigma:* PWTB/HIV reported experiencing a lack of empathy and trust from HPs, families, and community. *Prejudices:* HPs, male PWTB/HIV, and families perceived female PWTB/HIV with UAU as 'unchaste'. HPs and families believed that PWTB/HIV with UAU lack treatment adherence and ability to manage alcohol abstinence sustainably. (Table 1) *Stigma Consequences:* PWTB/HIV reported loneliness, helplessness, low self-esteem, and concealed their drinking from families and HPs as consequences of perceived and experienced stigma.

Stigma Experiences			Stigma Practices	
Perceived stigma	Experienced Stigma	Self-Stigma	Prejudices	Discriminatory behaviors
PWTB/HIV reported: 1. Fear of being neglected by health providers due to their unhealthy alcohol use (UAU). 2. Fear of being labeled as a 'bad person' by the neighborhood due to their UAU and disease conditions. 3. Fear of being labeled as 'an irresponsible and bad person' by their family members if they disclose their UAU and disease conditions. 4. Fear of being blamed by family and society for their UAU as the cause of their disease condition. Families of PWTB/HIV reported: 5. Fear of social alienation due to the presence of UAU and disease conditions in their household.	PWTB/HIV reported: 1. Receiving negative social labels such as 'irresponsible, immoral' etc. from some community members due to their UAU and disease condition. 2. Receiving a lack of empathy while seeking healthcare and a lack of trust in their ability related to alcohol abstinence from some health providers due to their UAU while attending clinics. 3. Neglect and lack of trust in their ability to alcohol abstinence received from family members. 4. Social alienation faced by the PWTB/HIV and their family members from the community due to their UAU and disease conditions.	1. Low self-esteem and negative self-image reported by the PWTB/HIV	1. Health providers do not trust PWTB/HIV with UAU to accurately report their alcohol use or adhere to alcohol abstinence. 2. Health providers reported low confidence in PWTB/HIV with UAU to moderate or quit alcohol use. 3. Low confidence among family members in PWTB/HIV with UAU regarding their ability to moderate or quit alcohol. 4. Health providers, family members, and male PWTB/HIV perceived female PWTB/HIV with UAU as "unchaste"	1. Some health providers mentioned that they sometimes rebuke and feel irritated with the PWTB/HIV and their family members while dealing with PWTB/HIV with UAU.

Table 1: Manifestations of Stigma related to unhealthy alcohol use (UAU) among people with Tuberculosis or HIV coinfection (PWTV/HIV).

Conclusions: Stigmas on UAU negatively impact PWTB/HIV's psychological well-being, potentially affecting their treatment adherence. Future research should prioritize combining stigma-reduction interventions at individual and community levels while treating PWTB/HIV with UAU, thereby enhancing patient-centered care.

EP33-1022-20 Determinants of tuberculosis-related stigma among school-aged adolescents in Bangkok, Thailand

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Background and challenges to implementation: TB remains a major public health issue in Thailand and globally, with stigma significantly affecting those impacted. Several factors contribute to TB-related stigma, including limited knowledge, low awareness, and negative perceptions about the disease.
Notably, high school students have been reported to exhibit stigmatizing attitudes toward individuals with TB, reflecting the influence of these factors among adolescents. However, there is still limited data focusing on the underlying causes of TB stigma among age group.
Intervention or response: Since the objective to explore factors associated with TB stigma among school adolescents in Bangkok, Thailand. A descriptive study design was employed. The participants were school adolescents aged 15-19 years old, who were studying in grades 10-12 in Bangkok, Thailand. A systematic sampling was used for the selection of the participants.
Data were collected by questionnaires consisting of the following four parts including
1. Demographic characteristics,
2. TB knowledge,
3. TB attitudes, and;
4. TB stigma.
Descriptive statistics were used to summarize the data, while Chi-square tests and Fisher's exact tests were employed to examine associations between variables.
Results/Impact: This study found that factors related to demographic characteristics significantly associated with TB stigma were sex, age, classes, and type of accommodation (p-value < 0.05).
Similarly, attitudes toward pulmonary TB were significantly associated with TB stigma (p-value= 0.014), while knowledge about pulmonary TB was no associated with TB stigma.
Conclusions: Several factors have been associated with TB-related stigma, including sex, age, grade level, type of accommodation, and attitudes toward pulmonary TB. The study suggests that targeted interventions should be implemented to improve TB knowledge, promote positive attitudes toward pulmonary TB, and strengthen advocacy and social mobilization.
These efforts are essential to reduce TB stigma and discrimination both direct and indirect within educational institutions such as public and private schools, vocational colleges, and universities.

EP33-1023-20 The change in the level of TB stigma in Ukraine during 2020-2024

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Background: Stigmatization of tuberculosis (TB) is one of the most significant social factors hindering equal access to medical services for people with tuberculosis (PWTB). It prevents timely seeking of medical help, negatively impacts treatment adherence, leads to deteriorating health conditions, and violates human rights. The impact of stigma across personal, family, medical, community, and legal environments was studied in Ukraine (2020–2021, 2023–2024).
Design/Methods: Two mixed-methods studies were conducted from June 2020 to March 2021 and from April 2023 to June 2024. The StopTBPartnership research tool was used to assess TB stigma. In both studies, the representative sample included 1,770 PWTB, 89 family members of PWTB, 82 community members, and 362 healthcare workers, all surveyed using semi-structured questionnaires developed for each group to assess stigma at various stages of TB treatment. The responses were analyzed and compared over time.
Due to COVID-19 in the first study and the war in the second study, data were collected remotely by trained interviewers. A desk analysis of the policy and legal environment was conducted in 2020 and 2023, and four focus groups were held to determine the stigma in legislation and the political environment.
Results: Between 2021 and 2024, self-stigmatization among PWTB and anticipated stigma in the community and healthcare decreased. Legal conditions improved, but secondary stigma within families increased. Details are provided in the table below.

Indicator	2021	2024
Self-stigmatization (PWTB)	47%	42%
Secondary stigma (family)	42%	45%
Anticipated stigma (community)	70%	52%
Anticipated stigma (healthcare)	63%	61%
Harm in legal environment	54%	21%

Conclusions: It is necessary to conduct educational campaigns to raise awareness about tuberculosis, based on respecting the rights of PWTB and ensuring access to medical services. To protect the rights of PWTB, it is necessary to continue improving the legal environment. Social and professional reintegration of PWTB must be ensured.

EP34 Advanced tools and strategies to enhance detection

EP34-1024-20 Person-centered solution to repeat sputum collection increases TB diagnosis in Manila, Philippines

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Background and challenges to implementation: Sputum Xpert testing plays a critical role in confirming tuberculosis (TB). However, challenges arise when initial results — MTB detected trace, Invalid/Error, or initial MTB detected Rif resistance detected — require patients to resubmit sputum sample for re-testing. Tondo, in Manila, Philippines is a densely populated area, with highly mobile and socioeconomically impoverished population. Médecins Sans Frontières (MSF) launched community-based Active TB Case Finding (ACF) with immediate on-site sputum collection for persons with presumed TB.
Despite timely availability of results, many people requiring repeat sputum testing fail to submit second sample to the health facility therefore delaying or foregoing treatment altogether. We describe a patient centered response to improved repeat testing.
Intervention or response: Competing everyday priorities such as work, and childcare were identified as major reasons for not submitting a second sample to the health facility for repeat testing. In response, MSF implemented a decentralized approach to sputum recollection in 2024. Instead of asking patients to resubmit sample to the health facility, sputum recollection was done directly at the household by MSF outreach nurses then transported to the laboratory for Xpert testing.

INDICATOR	2023	2024
Xpert tests done	5455	5052
Required repeat testing	203 (3.7%)	167 (3.3%)
Repeat test done	73 (40%)	139 (83%)
Diagnosed with TB	61 (84%)	104 (75%)
Drug-susceptible TB	54 (89%)	94 (90%)
Drug-resistant TB	7 (11%)	10 (10%)

Results/Impact: In 2023, before the implementation of household sputum collection, 203 participants required repeat testing and only 40% (73/203) were able to submit second specimen to the health facility, of which 84% (61/73) were diagnosed with TB. In 2024, when MSF started household sputum recollection, of 167 ACF participants needing repeat testing, 83% (139/167) successfully submitted sample, of which 75% (104/139) were diagnosed with TB.
Conclusions: A decentralized approach to sputum recollection is patient centered and effectively increases TB diagnosis in an impoverished and densely populated area. This intervention highlights the importance of adaptable, patient-centered strategies in addressing public health challenges, which may be replicated elsewhere and be scaled up through local partnerships and capacity building of community health workers to conduct sputum collection.

EP34-1025-20 Accuracy of computer aided detection (CAD) for TB screening among ex-miners in Mafeteng District, Lesotho

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Background and challenges to implementation: Improving TB case finding in Lesotho has become a priority in the quest to end TB. With a TB incidence of 661 per 100,000 population, Lesotho remains a high TB burden setting with a significant gap of 63% in TB case notification. To improve TB case detection, Lesotho adopted the WHO recommendation, following the findings of the TB prevalence survey, and introduced the use of CXR with CAD for TB screening. A campaign to screen ex-miners was launched in Mafeteng district in an attempt to find the missing people with TB.
Intervention or response: The Lesotho Ministry of Health deployed mobile X-rays with AI to the district, mainly for community TB screening among ex-miners. TB screening was conducted at the centre of excellence set up previously under the World Bank project for ex-miners. 740 ex-miners were screened using CXR+CAD and symptom-based screening. Sputum samples collected from these individuals were sent for GeneXpert analysis at the district laboratory for bacteriological confirmation.
Results/Impact: Of the 740 ex-miners screened, AI indicated that 200 (27%) had abnormal findings, but 135 (68%) of them were suggestive of TB. Of the 135 ex-miners, 116 (86%) were initiated on 1st line TB treatment without bacteriological confirmation but based solely on AI interpretation, while the remaining 19 (14%) were not evaluated.
Upon receipt of the GeneXpert results, all 135 ex-miners tested negative for TB and were subsequently referred to the district hospital for further evaluation and appropriate treatment.

Conclusions: The use of CXR with AI can increase efficiency in finding more people with TB when used correctly as a screening tool rather than diagnostic, especially in ex-miners with a previous history of lung damage or silicosis.
GeneXpert remains the initial test for TB disease; over-reliance on the use of CXR + CAD alone in ex-miners can lead to unnecessary TB treatment.

EP34-1026-20 Active TB case finding amidst insecurity: Wellness On Wheels (WOW) experience In Benue State Nigeria

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Background and challenges to implementation: According to the Punch newspaper (19 July, 2024), 50 rural communities in Benue state recorded at-least 135 attacks leading to deaths of over 2,600 people, many of whom are women and children. This has left hundreds displaced, wounded, raped and others kidnapped. Benue has 23 LGAs of which 18 have been affected by insecurity and continuous attacks by armed attackers.
As a result, population displacement, malnutrition and overcrowded living conditions especially in the IDP camps and banditry affected areas increases TB transmission.
Intervention or response: KNCV Nigeria is a non profit organization implementing a USAID grant, TB local organization network (TB LON) project across 14 states in Nigeria to fight against TB and other highly infectious diseases of public health concern.
Security planning, risk assessment, collaboration with relevant stakeholders, Local government TB supervisors and community leaders was done to ascertain the risk level before engaging in any community.
The WOW truck contains an xray unit(for chest xray) and 2 genexpert machines (for confirmatory test) all powered by 4 solar panels
The WOW truck was deployed to screen consenting adults for TB in Gwer west and east, Naka, Aondona, Otukpo, Guma, Gbajimba, Daudu, Ortese, Kwande, Vandekiya, Konshisha and Gboko.
Results/Impact: Across Benue state from January to December 2023, the WOW truck screened a total of 38,059 people, identified 3,001 presumptives, evaluated 3,001, diagnosed 621 TB cases and enrolled 617. The intervention stood among other interventions as it has the lowest number needed to test(NNT) as well as number needed to screen(NNS). The WOW truck gains more attention due to the fact that it served as a diagnostic and advocacy tool.
Conclusions: Insecurity often leads to displacement, TB programs must be adaptable to the high mobility of affected population, ensuring the continuity of essential health services in regions where insecurity poses significant barriers to healthcare delivery.

EP34-1027-20 Chest X-ray referral and financing partnership to enhance TB diagnosis in South Jakarta, Indonesia

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Background and challenges to implementation: In Indonesia, individuals with suspected tuberculosis (TB) initially undergo molecular rapid testing using sputum samples at primary healthcare centers (PHCs). For those with negative results but persisting clinical symptoms, a chest X-ray (CXR) is required for further assessment. However, limited CXR infrastructure at PHCs and lack of national health insurance coverage create access barriers. In 2024, an estimated 1.9 million presumptive TB cases with negative sputum tests remained unevaluated by CXR, representing a major gap in the diagnostic cascade.
Intervention or response: To address this, Stop TB Partnership Indonesia (STPI), the South Jakarta City Health Office, and two private laboratories initiated a corporate-funded public-private partnership across 10 PHCs. Through this initiative, individuals presumed to have TB are referred by PHCs to the nearest participating laboratory. STPI developed a simple digital referral system that allows PHCs to submit patient referrals, which in turn prompts laboratories to provide CXR services at no cost to patients. Once the examination is completed, the laboratories upload the CXR results back to the PHCs through the same digital platform, enabling timely follow-up. Financial coverage conducted through monthly reimbursement claim submissions by laboratories to STPI.
Results/Impact: In four months, 188 patients were referred for CXR; 158 (84%) completed the examination. Of these, 93 (59%) returned to PHCs for further assessment, resulting in 20 confirmed TB diagnoses (figure)—a yield of 12.6%, significantly higher than the 4.8% average in national active case finding. This highlights the value of CXR in high-risk, sputum-negative individuals. Despite strong uptake, post-CXR drop-off underscores the need for improved patient navigation and follow-up.
Conclusions: This intervention demonstrates the feasibility of public-private partnerships in closing diagnostic gaps for TB. Its high diagnostic yield and operational practicality suggest strong potential for integration into national TB programs, particularly to strengthen the diagnostic pathway for sputum-negative individuals in resource-limited settings.

EP34-1028-20 Enhancing TB prevention and care efforts among high-risk population: Results from hospital-based targeted service delivery point screening in Nasarawa State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a major global health challenge, particularly among high-risk and underserved populations. Despite their vulnerability and contribution to the global TB burden, these groups are often not adequately prioritized in TB control efforts. Effective TB management depends on timely and accurate diagnosis, prompt treatment initiation, and consistent adherence to treatment regimens. This study assessed TB yields across various hospital service delivery points (SDPs) in Nasarawa State to evaluate case detection and treatment initiation outcomes, thereby informing strategies for strengthening TB control among high-risk populations.
Intervention or response: From January to December 2023, the USAID-funded TB LON 1&2 project, implemented by KNCV Nigeria, intensified TB case-finding interventions across health facilities in Nasarawa State. TB screening was conducted at eight predefined hospital service delivery points (SDPs), targeting all patients and their accompanying relatives. Individuals identified as presumptive TB cases were evaluated and, if confirmed positive, promptly initiated on treatment. All data were documented in national registers and tracked using the COMMCARE app.

Hospital risk group	# of clients screened for TB	#presumed to have TB	#Evaluated for TB	# Diagnosed with TB	#Started on treatment	%TB yield
Accident and emergency	872	14	14	1	1	7%
Antenatal Clinic	5772	215	198	6	6	3%
Art clinic	20583	1995	1937	177	167	9%
Immunization	333	16	16	1	1	6%
Diabetes	591	36	34	2	2	6%
Elderly	9358	6%	64	74	69	9%
MOPD	4292	154	143	20	20	14%
POPD	6182	373	348	30	30	9%
Total	47,983	3,759	3554	311	296	9%

Results/Impact: A total of 47,983 individuals were screened. Among these, 3,759 were identified as presumptive TB cases, with 3,554 (94%) undergoing further evaluation. This led to the diagnosis of 311 TB cases, and 296 (95%) of them were initiated on treatment. TB yields varied across service delivery points, with the highest observed at the MOPD (14%) and ART clinic (9.1%). The Geriatric unit (8.6%) and POPD also had significant yields, indicating the TB burden among elderly clients and children. The lowest yield was recorded among pregnant women.
Conclusions: Targeted TB testing should be prioritized to increase yield, especially amongst high-risk populations. We recommend tailoring TB screening strategies and prioritizing resource allocation based on risk profile and TB yield within hospital settings, as this supports global efforts toward universal health coverage and ensures inclusive access to care, leaving no one behind.

EP34-1029-20 The contribution of screening to global TB notification

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Background and challenges to implementation: Progress towards the End TB Strategy goals of finding all people with TB, and thereby reducing TB incidence, has stalled. The 2023 UN High-Level Meeting on Tuberculosis (TB) set new targets to achieve at least 90% TB treatment coverage by 2027. Global TB notification has increased in the wake of the COVID-19 pandemic. However, a gap of close to 3 million TB cases remains when compared with global TB incidence. Systematic TB screening and active TB case finding (ACF) efforts need to be stepped up to bridge this gap.
Intervention or response: We used country data collected annually by WHO for the Global TB Report to calculate the proportion of TB notifications deriving from screening and ACF in 2023.

Map. Percentage of people newly diagnosed with TB (new and relapse cases) reported through TB screening efforts, 2023.

Results/Impact: In 2023, 114 countries reported the number of people newly diagnosed with TB who were identified through provider-initiated screening and ACF

efforts in high-risk groups such as contacts, people living with HIV, people in prisons and mining communities, and through community-based ACF efforts among high-risk groups and facility-based screening of people with diabetes and other risk factors. In the 114 countries, a median of 12% [IQR: 3-29%] of the total new and relapse cases reported originated from screening and ACF activities.

Of 66 high-priority countries, 52 reported that in 2023 a median of 89% [IQR: 25-100%] of administrative levels regularly undertook screening and ACF using chest X-ray, a critical screening tool.

Conclusions: Despite a non-negligible contribution of screening activities to global TB notification and widespread availability of chest X-rays at peripheral levels, TB treatment coverage remains suboptimal. Chest X-ray coverage and screening activities need to be expanded in high-burden communities and countries, alongside greater access to accurate chest X-ray interpretation (including computer-aided detection software) and confirmatory testing.

EP34-1030-20 Mapping margins: A geospatial and programmatic analysis of TB loss-to-follow-up in border districts of Tamil Nadu, India

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Background: Tamil Nadu, a geographically expansive state in southern India, shares borders with four other states and one union territory—regions that often function as programmatic peripheries with potential systemic vulnerabilities. This study evaluates whether Tuberculosis Units (TUs) located in border districts exhibit a higher burden of Loss to Follow-Up (LFU), conceptualizing LFU not only as a program outcome but as a geographically patterned, system-mediated phenomenon.

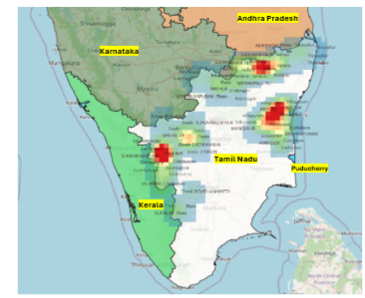
Objectives:

i. To compare LFU proportions among TB cases notified in 2022, between border and non-border districts, following a two-year outcome ascertainment period.
ii. To map the spatial distribution of LFU using QGIS and examine clustering patterns in TUs near state borders

Design/Methods: A TU-level operational analysis was conducted using 2022 National TB Elimination Programme (NTEP) data. Eight border districts were purposively selected to represent all neighboring states/UTs, along with eight centrally located non-border districts. LFU was defined as the proportion of cases lost to follow-up, excluding transfers. Spatial distribution was visualized using QGIS v3.40.3. Statistical comparisons were made using the Mann-Whitney U test after normality assessment via the Shapiro-Wilk test.

Results: Analysis from 234 TUs (127 border, 107 non-border) showed significantly higher LFU in border TUs (mean ± SD: 2.76 ± 2.65%; median: 1.89%) than in non-border TUs (1.58 ± 1.89%; median: 0.99%) (Mann-Whitney U = 8554.5, $p < 0.001$). QGIS mapping revealed that while LFU hotspots were observed in border TUs of Coimbatore, Villupuram, and Vellore, spatial heterogeneity persisted beyond administrative boundaries.

Figure 1: Spatial Distribution of TB Loss to Follow-Up cases (%) across Border district TUs of Tamil Nadu, 2022*



Inference: Geospatial mapping reveals distinct LFU hotspots in border districts, notably in Villupuram, Vellore and Coimbatore. While higher LFU rates cluster along some border regions, the distribution is heterogenous and non-uniform, with isolated hotspots also appearing beyond border zones.

Conclusions: Higher LFU in border TUs highlights the vulnerability of peripheral programmatic zones. However, significant spatial heterogeneity suggests that localized health-system factors, not geography alone, influence treatment retention. Integrated geographic and programmatic surveillance is vital for targeted interventions.

EP34-1031-20 Community health workers as frontline soldiers in TB prevention and care in Anambra State, Nigeria: Successes and challenges

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Background and challenges to implementation: Tuberculosis (TB) continues to pose a major public health threat, especially in low-resource settings like Anambra State, South-eastern Nigeria, which is one of the TB high burden states. Community Health Workers (CHWs) play a vital role in connecting national TB programs with hard-to-reach populations. However, challenges such as irregular training, poor remuneration, weak supervision, fragmented data systems, and lack of sustainable financing hinder effective CHW integration. Additional barriers like stigma, low health literacy and weak community ownership also reduce program effectiveness.
Intervention or response: To address these issues, TB programs in Anambra State implemented a comprehensive strategy involving CHW training on active case finding, contact tracing, sputum collection and health education. Community sensitization was enhanced through peer-led campaigns and engagement of local leaders. CHWs also supported defaulter tracing and psychosocial care. Routine supervision and performance monitoring were strengthened, with the introduction of electronic tools like the COMMTB App for patient tracking.
Also use of PDX (Portable Digital X-ray) to conduct screening during outreaches in the community also contributed to case detection. Data collection and analysis were conducted monthly to monitor progress and outcomes.
Results/Impact: CHWs significantly boosted TB case notifications in Anambra State, contributing 62.75% (8,238 cases) in 2023 and 51.26% (5,530 cases) in 2024. Communities experienced improved TB awareness and reduced stigma. Treatment success rates increased, and loss to follow-up declined. Programs with structured CHW training, regular stipends, and effective supervision showed better outcomes. Persistent gaps included digital literacy and sustainable funding.
Conclusions: CHWs are crucial in enhancing TB response through community engagement and patient-centered support. Their integration into TB control efforts must be strengthened via standardized training, sustainable financing, digital tools, and supportive policies. Empowering CHWs as long-term partners is essential for TB elimination, with potential for adaptation in other high-burden settings.

EP34-1032-20 TB incidence and impact of mass screening and treatment for latent tuberculosis infection among North Korean refugees

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Background: Tuberculosis (TB) remains a public health concern, and North Korean refugees are a high-risk group due to the high TB burden in their country of origin and healthcare access barriers. In 2014, South Korea implemented a mass latent TB infection (LTBI) screening and treatment program for this population. This study evaluated its impact on reducing the incidence of active TB.
Design/Methods: Using the National Health Information Database (NHID), we conducted a retrospective cohort study including 33,304 North Korean refugees who entered South Korea from 2008 to 2019. Participants were classified into an intervention group (n=10,772, entered 2014–2018) and a control group (n=18,597, entered 2008–2013).
The primary outcome was active TB, identified via ICD-10 codes. We used Kaplan-Meier survival curves and Cox proportional hazards models to compare TB incidence between groups.
Results: The 5-year cumulative incidence of TB decreased from 781.9 to 284.6 per 100,000 person-years (PY) over the study period. The intervention group had a significantly lower incidence rate than the control group, with a rate difference of -246.2 per 100,000 PY (95% CI: –319.6 to –172.8) and an adjusted hazard ratio (HR) of 1.54 (95% CI: 1.31–1.81). When excluding TB cases diagnosed within six months of entry (concurrent TB), the HR increased to 1.80 (95% CI: 1.50–2.16).
However, among adults aged 65 and older, no protective effect was observed. The program's protective effect was maintained for up to five years post-entry but gradually declined afterward.
Conclusions: The LTBI screening and treatment program was associated with a reduced risk of active TB among North Korean refugees.
However, its effectiveness was not evident in older adults, highlighting the need for age-sensitive approaches and sustained, targeted TB control policies for vulnerable populations.

EP34-1033-20 Screening for TB using ultraportable handheld X-ray with AI for early detection of disease in Bihar, India

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Background and challenges to implementation: National Tuberculosis Prevalence Survey in India (2019-21) highlighted the benefit of chest radiography for TB screening but availability, accessibility and capacity constraints at peripheral public health institutions (PHI) limit its uptake. TB case finding in Bihar, India has conventionally been passive, relying upon symptomatic screening.
Intervention or response: During December 2024-March 2025, Bihar implemented a 100-day intensified case finding campaign across select (n=10) districts, including Darbhanga, Muzaffarpur and East Champaran. The state deployed six ultraportable handheld X-ray devices, equipped with artificial intelligence (AI)-based interpretation with support of William J Clinton Foundation (WJCF) across the above named three districts, having a combined population of ~16.87 million. Community-based active case finding (ACF) camps were organized with systematic mobilization of key vulnerable population (KVP).
Results/Impact: 503 ACF camps were organized, screening 49,044 beneficiaries from the KVP for TB symptoms and radiological presentation. 30% beneficiaries (14,849/ 49,044) reported at least one symptom; 10% (5,137/49,044) of screened beneficiaries had TB suggestive X-ray. Sputum samples of beneficiaries who were symptomatic and/or had a radiograph suggestive of TB were tested for confirmation of diagnosis. Of the 15,450 samples, 74% (n=11,374) were tested using nucleic acid amplification tests (NAAT) and remaining through smear microscopy. 336 patients with bacteriologically confirmed TB were diagnosed and initiated on treatment, ~16% of whom were asymptomatic.

		Chest X-ray status			Sputum test status			
District	Number of ACF camps done	People screened with chest X-ray	People with TB Suggestive chest X-ray	People with other Chest Abnormalities	No. of samples tested with NAAT	NAAT Positive	No. of samples tested with smear microscopy	Smear Positive
Darbhanga	167	16545	1763	3606	3999	133	977	36
Muzaffarpur	171	17384	1612	3076	2140	64	2681	11
East Champaran	165	15115	1762	3120	5235	92	418	0
Total	503	49044	5137	9802	11374	289	4076	47

Figure 1: District-wise details of camps and beneficiaries screened and diagnosed with TB.

Conclusions: AI-enabled ultraportable X-ray can potentially increase TB case finding, especially amongst the asymptomatic individuals. Evidence generated from the 100-days ACF campaign prompted the government of Bihar to initiate procurement of 122 ultraportable X-ray devices for active community-level TB screening across all 38 districts through a tender process.

EP35 Integrating systems to improve TB care outcomes

EP35-1034-20 The effectiveness of community engagement in improving drug-resistance TB service delivery and enrolment outcomes in Kogi State

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Background and challenges to implementation: Drug-resistant tuberculosis (DR-TB) remains a significant public health challenge in Nigeria, a country with one of the highest DR-TB burdens in Africa. In Kogi State, the prevalence of multidrug-resistant TB (MDR-TB) has increased, particularly in the Eastern Senatorial District (Ankpa, Dekina, Olamaboro, Ofu). Between 2019 and 2023, TB control efforts were hindered by socio-economic factors, stigma, cultural beliefs, and health system constraints, leading to enrolment gaps in DR-TB treatment. Limited healthcare accessibility, inadequate patient follow-up, fear of hospitalization, and reliance on traditional healing practices contributed to delays in diagnosis and treatment initiation.
Intervention or response: The Kogi State Tuberculosis, Leprosy, and Control Program (STBLCP) implemented targeted strategies to close the enrolment gap. These included intensified community engagement, stigma-reduction campaigns, training of healthcare providers on patient-centred approaches, and the use of patient tracking systems to reduce loss to follow-up. Additionally, community health workers and linkage coordinators were engaged to facilitate case finding and treatment initiation. Efforts were also made to integrate DR-TB services into primary healthcare settings to improve accessibility. A survey was conducted to determine the causes of these gaps.
Results/Impact: Between 2019 and 2023, DR-TB case notifications increased, yet enrolment on treatment lagged behind diagnoses. In 2019, 46 DR-TB cases were diagnosed, but only 33 (71.7%) were enrolled on treatment. By 2023, 70 cases were diagnosed, with 61 (87.1%) enrolled. Despite these improvements, gaps persisted due to social stigma, financial constraints, and health system inefficiencies. Notably, loss to follow-up, alternative treatment-seeking behaviours, and delayed care-seeking remained key challenges.
Conclusions: Addressing the DR-TB enrolment gap requires a multi-faceted approach, including enhanced community sensitization, financial support mechanisms, and improved patient tracking systems. Strengthening healthcare infrastructure, expanding diagnostic services, and fostering collaboration with community stakeholders will be essential to achieving Nigeria's End TB Strategy goals and ensuring equitable access to DR-TB treatment.

EP35-1035-20 Challenges, progress and opportunities towards TB elimination in New South Wales, Australia

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Background and challenges to implementation: Australia is a low tuberculosis (TB) incidence country, with stable incidence rates; <10/100,000 population for more than 30 years. In 2024, there were 523 people diagnosed with TB in the state of New South Wales (NSW) corresponding to a notification rate of 6.3 per 100,000 population. Notification rates are tied closely to migration patterns, with 91% of people diagnosed with TB born overseas and approximately 5% local transmission per year.
Intervention or response: We critically evaluated elements of the WHO 'Towards Tuberculosis Elimination Action Framework for low incidence countries' in the context of NSW, Australia.
We analysed population, migration, and programmatic TB data and critically reflected on clinical and public health management, as well as evolving challenges and opportunities for TB elimination.
Results/Impact: Most WHO key priorities and actions are embedded in NSW policy. There has been progress in implementation and/or improvements in
1. Enhanced data capability and reporting,
2. Tracking key indicators including TB death reviews,

3. Integration of genomics into TB care and control,
4. Universal contact screening and
5. Increased migrant screening and follow-up.

TB care is free of charge and there has been increased focus on patient-centred care. Patient management is supported by expert panel review for rifampicin-resistant TB and other complex patients, and increased access to TB medications via the Global Drug Facility. TB-specific education opportunities and networks within NSW Health maintain connectedness and workforce competency.

Conclusions: Whilst TB elimination remains out of reach in NSW with increasing migration from high TB incidence countries, significant progress has been made in NSW to enhance patient care and disease control, supported by genomics to track local transmission and data optimisation for better monitoring and reporting. Further opportunities include increased primary care involvement in screening and TB preventive treatment, and better cultural engagement of affected communities.

EP35-1036-20 Performance-based incentives to improve quality of TB care at primary healthcare providers in Indonesia

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Background and challenges to implementation: Indonesia has the world's second-highest tuberculosis (TB) burden (GTB, 2024). Despite the highest TB notifications in 2024, 58% of cases were managed at secondary facilities (NTP, 2025). Primary healthcare (PHCs) plays a significant role in TB management, however, 39% of TB patients were referred by PHCs to secondary facilities, with 97% involving uncomplicated TB cases suitable for primary-level management (NHI, 2019).

This practice increases healthcare costs and worsens treatment outcomes. The Ministry of Health Indonesia, in collaboration with partners, piloted the performance-based incentive for primary healthcare providers.

Intervention or response: Between July 2023 to June 2024, Innovative TB Financing were implemented across 675 primary healthcare providers in six Indonesia, including a two-tiered performance-based incentives for PHCs: ~$3 per patient completing the intensive phase (2 months) of TB treatment and ~$7 per patient achieving full treatment completion. In addition, technical assistance was provided during the pilot.

Results/Impact: Compared to the previous year's period, TB case notification increased by 9.7% across all piloted PHCs, exceeding the national increase of 3.3%. Notably, private PHCs notified a 95% increase, substantially higher than the national average of 37%. The treatment success rate (TSR) at PHCs in the piloted districts also improved from 81% to 90%, higher than the TSR of PHCs at the national level, which is 89%.

Conclusions: Performance-based incentives demonstrated efficacy in enhancing TB case detection and improving care quality across PHC providers. Therefore, this innovative financing model will be expanded at the national level to strengthen TB management at the primary care level.

EP35-1037-20 Discrete choice experiment suggests that person-centered treatment support could be achieved by offering a choice between two interventions

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Background: Treatment support should address the most important barriers to adherence, but these barriers differ among people with TB. Understanding heterogeneity in treatment support needs is important for designing person-centered programs.

Design/Methods: We administered a discrete choice experiment asking people newly diagnosed with TB in Lima, Peru what support interventions would best help them complete treatment. We used a community-engaged process to identify five interventions designed to promote treatment adherence by addressing different domains of health care accessibility according to the "5 A's" conceptual framework. We presented hypothetical intervention packages comprising combinations of community-based treatment, conditional cash transfers, counseling, a social worker visit, and anti-stigma training for health center staff. Analysis was conducted using hierarchical Bayes modeling followed by latent class analysis, then logit regression to identify factors associated with probability of class membership.

Results: There were five classes among 284 respondents. Class 1 (26%) viewed all interventions positively and prioritized community-based treatment; age 15-24 was associated with class membership (OR versus age ≥45 = 2.1, 95% CI 1.1-3.7). Class 2 (23%) viewed all interventions positively and prioritized cash transfers. Classes 3

and 4 each viewed one of the interventions negatively, with class 3 (27%) rejecting counseling and class 4 (16%) rejecting cash transfers. Formal sector employment was borderline significantly associated with class 4 membership (OR=1.6, 95% CI 1.0-2.7). Class 5 (8%) prioritized cash transfers and viewed both community treatment and anti-stigma intervention negatively; male sex was non-significantly associated with class membership (OR=3.3, 95% 0.9-11.9).
Conclusions: Overall, people with TB in Lima, Peru identified community treatment and conditional cash transfers as the most important forms of treatment support, but neither was acceptable to everyone, and their relative priority varied. Offering a choice between the two would promote patient-centered care by giving each person a form of support they prioritize.

EP35-1038-20 Providers' perceptions of integrating mental health care in TB services in the Free State, South Africa

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Background: Highlighting their crucial role in implementing global and national mental health care (MHC) decentralisation and integration policies, this study examined public healthcare providers' perceptions of MHC integration within tuberculosis (TB) programme services in the Free State province.
Design/Methods: A qualitative design was employed, incorporating 13 key informant interviews that were thematically analysed. The study utilised the Consolidated Framework for Implementation Research (CFIR) alongside the World Health Organization's health systems building blocks framework to investigate providers' perceptions of barriers and facilitators.
Results: Regarding the CFIR 'innovation' domain, providers emphasised the importance of health education for TB patients and their families. In the 'outer setting' domain, they identified significant barriers to MHC-TB integration, such as stigma and perceptions of MH disorders as witchcraft. Providers also noted limited support from non-governmental organisations and insufficient financing, exacerbated by poverty and unemployment. For the 'financing' and 'medicine' building blocks, a dedicated budget for MHC and a consistent drug supply were respectively seen as potential facilitators. 'Inner setting' barriers included 'workforce'-related issues, such as professionals' reluctance to engage with MH issues. In respect to 'individuals' or 'people,' providers highlighted shortages of social workers, nurses, doctors, psychiatrists, and psychologists, leading to missed essential MH support.
Conclusions: Findings underscore that MHC-TB integration in the Free State is essential yet complex. Providers' perceptions highlighted the crucial role of 'individuals' or 'people' both as barriers and facilitators in such integration. Perceived challenges included stigma and inadequate resources. Providers also stressed the need for enhanced health education for patients and families, as well as improved training for healthcare providers. MHC-TB integration requires a holistic strategy addressing contextual factors highlighted by the CFIR and strengthening all health systems building blocks – particularly the 'people' component. These efforts are essential for transforming MHC and improving outcomes for TB patients with co-morbid MH conditions.

EP35-1039-20 Strengthening TB drug supply chains to reduce stockouts: Lessons from Nasarawa State, Nigeria

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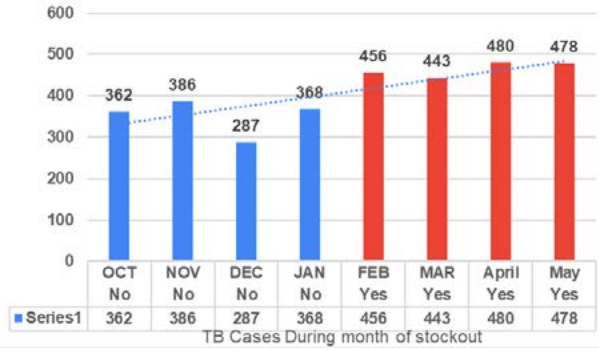
Background: The consistent availability of Tuberculosis (TB) drugs is critical to the success of TB prevention programs, particularly in high-burden regions like Nasarawa State, Nigeria. However, the state has experienced recurrent stockouts of TB drugs, primarily due to inefficiencies in the supply chain management (SCM) process.
This study provides actionable recommendations for policymakers, program implementers, and stakeholders to strengthen the TB drug supply chain in Nasarawa State.
Design/Methods: A mixed-methods approach was employed, combining descriptive surveys and interviews conducted between October 2023 and May 2024, while inferential statistics (Wilcoxon signed-rank test) were applied to determine statistical significance in case diagnosis before and during stockout. Fifty-seven Directly Observed Treatment (DOT) centers were randomly selected across urban (40%) and rural (60%) areas, including hard-to-reach locations and pretested questionnaires were administered to 114 respondents, including DOT officers (70%), healthcare providers (20%), and supply chain managers (10%) to determine the causes of TB drug stock out.
Results: A mixed-methods approach was employed, combining descriptive surveys and interviews conducted between October 2023 and May 2024, while inferential statistics (Wilcoxon signed-rank test) were applied to determine statistical significance in case diagnosis before and during stockout. Fifty-seven Directly Observed Treatment (DOT) centers were randomly selected across urban (40%) and rural (60%) areas, including hard-to-

reach locations and pretested questionnaires were administered to 114 respondents, including DOT officers (70%), healthcare providers (20%), and supply chain managers (10%) to determine the causes of TB drug stock out.



Background and challenges to implementation: The consistent availability of Tuberculosis (TB) drugs is critical to the success of TB prevention programs, particularly in high-burden regions like Nasarawa State, Nigeria. However, the state has experienced recurrent stockouts of TB drugs, primarily due to inefficiencies in the supply chain management (SCM) process.

This study provides actionable recommendations for policymakers, program implementers, and stakeholders to strengthen the TB drug supply chain in Nasarawa State.

Intervention or response: A mixed-methods approach was employed, combining descriptive surveys and interviews conducted between October 2023 and May 2024, while inferential statistics (Wilcoxon signed-rank test) were applied to determine statistical significance in case diagnosis before and during stockout. Fifty-seven Directly Observed Treatment (DOT) centers were randomly selected across urban (40%) and rural (60%) areas, including hard-to-reach locations and pretested questionnaires were administered to 114 respondents, including DOT officers (70%), healthcare providers (20%), and supply chain managers (10%) to determine the causes of TB drug stock out.

Results/Impact: This study identifies critical gaps in TB drug SCM in Nasarawa State, including inadequate SCM training for 84% of DOT officers, the absence of flowcharts in 70% of facilities, and underutilized stock cards of 73%.

Stockouts, particularly in rural and hard-to-reach areas, correlated with TB case increases from 362 in October to 478 in May, with a p-value of 0.02. Rural and hard-to-reach areas experienced more frequent stockouts due to logistical challenges and infrequent visits by the state pharmacies.

Conclusions: To prevent TB drug stockouts, this study recommends revising standard operating procedures, developing stock shortage prevention guidelines, and enhancing intra-state drug transfer logistics. Regular SCM training for DOT officers, strengthening monitoring and evaluation systems, and mandating TB stock card utilization across all facilities are essential. These measures will ensure consistent drug availability and improve TB prevention outcomes in Nasarawa State.

EP35-1040-20 Exploring and preparing for BPaLM adoption in India: A system-level analysis using the EPIS framework

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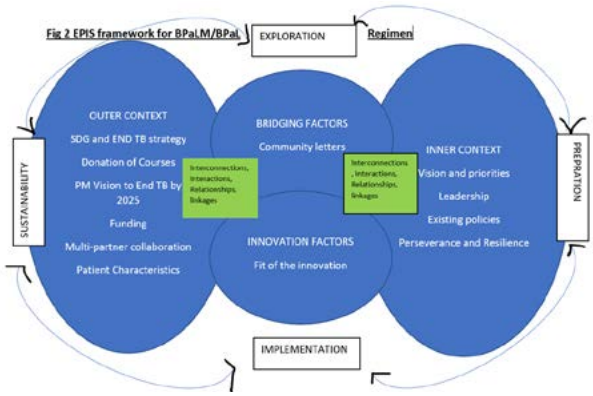
Background and challenges to implementation: India bears 26% of the global burden of drug-resistant tuberculosis (DR-TB), with low treatment success and high mortality rates. The WHO-recommended 6-month BPaLM regimen offers a shorter, safer, and more effective all-oral treatment. In response, the National TB Elimination Programme (NTEP) began systematically assessing its feasibility and programmatic integration. This study evaluates those preparatory and exploratory efforts toward BPaLM adoption in India.

Intervention or response: The EPIS (Exploration, Preparation, Implementation, Sustainment) framework guided the analysis of early BPaLM adoption in India, focusing on the exploration and preparation phases. A document review of national guidance, trial evidence, meeting records, and global policy informed the study. Strategic and operational activities were examined across four EPIS domains—outer context, inner context, bridging factors, and innovation fit—to identify key enablers and barriers.

Results/Impact: The exploration phase identified critical challenges in managing DR-TB in India, including limited treatment options, treatment adherence, high mortality, and substantial health system costs. Global evidence from landmark trials (Nix-TB, ZeNix, TB PRACTECAL) demonstrated the BPaLM regimen's superior efficacy, safety, and cost-effectiveness, prompting national interest. During the preparation phase, NTEP initiated studies for effectiveness of BPaLM in Indian population and Health Technology Assessment (HTA) with the support of Indian Council of Medical Research, developed guidance document, and secured stakeholder engagement s. Interim trial results showed >90% treatment success and strong safety profile. The initial implementation aligned with national priorities and was driven by four enablers: strong policy leadership (**inner context**), global partnerships and resource support (**outer context**), community advocacy (**bridging factors**), and regimen simplicity with patient and system-level benefits (**innovation fit**)—collectively laying the foundation for nationwide scale-up.



Conclusions: By focusing on exploration and preparation phases, the study highlights often-overlooked factors critical for successful implementation. This approach offers a replicable model for introducing complex health innovations in high-burden settings.

EP35-1041-20 Challenges in TB referral processes and health workers' perspectives in Indonesia: A qualitative study

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Background: According to the 2023 WHO Global Tuberculosis (TB) Report, Indonesia reported an estimated 1,060,000 TB cases, with an incidence rate of 385 per 100,000 population. While drug-susceptible TB (DS-TB) notification rates have improved—reaching 77% of the estimated total cases—the gap between case detection and treatment initiation has widened, increasing from 8% in 2021 to 12% in 2023. This treatment enrollment gap can result in delayed care, worsening health outcomes, and continued TB transmission. A functional TB referral system is essential to ensure timely linkage to care. This study aimed to explore healthcare workers' perspectives on barriers affecting TB referral effectiveness in Indonesia.
Design/Methods: A qualitative analysis was conducted using data from 80 TB program stakeholders across various districts and cities in Indonesia. Participants included TB program managers, technical officers, and field staff from district and city health offices. A structured questionnaire was distributed, focusing on perceived barriers in TB referral processes. Data were analyzed using NVivo software, with thematic coding guided by a literature-informed framework on TB referral system challenges.
Results: Several key barriers were identified, including inadequate communication between health facilities, limited patient access due to geographic and financial constraints, and a lack of standardized referral protocols. Health workers also reported challenges in coordinating follow-up procedures, while patients faced delays from administrative and bureaucratic inefficiencies. These issues collectively hinder the continuity and quality of TB care.
Conclusions: mproving TB referral processes requires multi-level interventions. These include strengthening inter-facility communication, developing clear referral guidelines, investing in healthcare staff capacity building, and providing logistical and financial support to patients. Addressing these systemic gaps is crucial to bridging the case detection-to-treatment initiation divide and achieving improved TB control outcomes in Indonesia.

EP35-1042-20 Empowering change: A study on the role of TB champions in strengthening National TB Elimination Programme indicators in Union territory, Chandigarh in India

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Background and challenges to implementation: The Ayushman Arogya Mandirs (AAMs) are local health facilities aiming to provide comprehensive, universal, and free primary healthcare services, focusing on wellness and expanding services closer to communities. The study aims to assess the impact of TB champions placed at these health facilities on National TB Elimination Program (NTEP) indicators through community mobilization, encouraging the symptomatic to come forward for testing and promoting adherence among the diagnosed cases.
Intervention or response: The Government of Chandigarh collaborated with a non-government organisation, IMPACT-India Project, implemented by TB Alert India, where 50 TB Champions were trained in December 2024. A gap analysis was done for all the AAMs across the city based on their case referral, notification, and treatment success rates. These trained champions were strategically placed across 30 selected low-performing AAMs out of 50 AAMs in the city. Their responsibilities included active case finding, contact tracing, adherence support,

TB awareness, and strengthening community engagement with TB services, particularly in underserved areas. Nikshay (India's web-based surveillance system) was used to extract data analysed in SPSS ver 22.

Results/Impact: Data from Quarter 1 (January to March) of 2024, when TB Champions were not deployed, was compared with Quarter 1(January- March) of 2025, when they were deployed. The results of this intervention are in Table 1.

Indicator	Q1 (January to March) 2024	Q1 (January to March) 2025	Increase (%)
Total TB cases notified	1,606	1,800	12%
Notifications from AAMs	507	581	15%
Household contacts initiated on TB Preventive Treatment	272	490	80%
Adherence Monitoring (Manual)	79%	89%	10%
Treatment Outcomes (Entered During Quarter 1)	119	231	94%

Table 1: National TB Elimination Program monitoring indicators for Chandigarh city (January- March 2024 vs January- March 2025)

This intervention significantly enhanced key NTEP indicators in Chandigarh ($p<0.05$). It led to increased TB case notifications, improved reporting, with a notable rise in notifications from AAMs and a significant improvement in treatment outcome reporting.

Conclusions: The survivor-led approach of TB Champions has effectively bridged service gaps and empowered local communities. Chandigarh's success suggests that this model can be replicated and scaled in other high-TB-burden regions, enhancing awareness and support for prevention and treatment efforts.

EP35-1043-20 Innovative models for TB/HIV integrated service delivery among pregnant women in an unconventional setting in Ogun State, Nigeria

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Background and challenges to implementation: Pregnant women living with HIV are at higher risk for tuberculosis (TB), yet TB screening and treatment services are often underutilized in antenatal care (ANC) settings. In Ogun State, Nigeria, an innovative TB/HIV integration model was introduced in faith-based and traditional birth attendant (TBA) facilities, where many pregnant women seek maternal care. This study evaluates the impact of this approach on TB case detection, treatment initiation, and maternal health outcomes.

Intervention or response: A mixed-methods study was conducted across selected faith-based and TBA facilities in Ogun State, where TB/HIV integrated screening and treatment services were introduced. Interventions included:

- On-site TB/HIV screening for pregnant women during ANC visits.
- Task-shifting to trained TBAs and religious leaders to facilitate case identification and referral.
- Use of mobile sputum collection and GeneXpert testing for rapid TB diagnosis.
- Pre- and post-intervention data were analyzed to assess changes in TB case detection rates, HIV-TB co-treatment initiation, and maternal health outcomes. Qualitative feedback from pregnant women and healthcare providers was also collected.

Results/Impact: The intervention resulted in a 42% increase in TB case detection among pregnant women compared to conventional ANC settings. Treatment initiation for TB/HIV co-infected women improved by 30%, with faster turnaround times due to on-site specimen collection and GeneXpert testing. Community acceptance of TB/HIV services within faith-based and TBA settings increased, leading to improved health-seeking behaviour. Challenges included initial resistance from traditional birth attendants, requiring extensive stakeholder engagement and training.

Conclusions: Integrating TB/HIV services into faith-based and TBA facilities significantly improved TB case detection and treatment among pregnant women in Ogun State, Nigeria. Scaling up this community-accepted model could bridge gaps in maternal TB/HIV care, especially in regions with low health facility utilization. Continued investment in capacity-building, digital health solutions, and community engagement is recommended for sustainability.

EP36 TB and comorbidities including mental health

EP36-1044-20 Optimising TB care: Differentiated TB care on affected person's outcome (Interventional study in Haveri district, Karnataka)

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Background and challenges to implementation: The End TB Strategy visions TB-free world, aiming for zero deaths and disease. In 2021, Karnataka reported 80,435 persons with TB (PwTB), with 7% TB fatality rate, while Haveri district, with limited tertiary health care, had a 9% TB fatality rate among its 1,322 PwTB. Early risk assessment during treatment initiation, with regular monitoring and clinical care, enhances treatment success. This intervention focused on catering differentiated care to all PwTB to assess impact on outcome.
Intervention or response: A training module was devised for the Primary Health Care Medical Officers (PHC MOs) and their staff during April and May 2022. Monthly clinical evaluations of PwTB were conducted on designated day, and PwTB were triaged based on vital signs, overall health condition, adverse drug reactions, and treatment progress. As per need, PwTB was referred to secondary or tertiary level of care. The effectiveness was evaluated by comparing outcomes among notified PwTB between June to August of 2021 and 2022. Data was collected using Excel and analyzed using SPSS software.

Outcome	2021	2022	P value
Success rate	342 (78%)	370 (87%)	
Death	42 (9.6%)	26 (6%)	<0.001
Loss to follow up	22 (5%)	11 (3%)	
Treatment failure	7 9 (1.6%)	1 (0%)	

Table: PwTB Outcome before and after the introduction of Differential TB care.

Results/Impact: A total of 438 and 426 PwTB were notified during June to August in 2021 and 2022 respectively. 341 PwTB (85%) of 2022 cohort were offered clinical evaluation. 2% of the PwTB had uncontrolled diabetes, adverse drug reaction who were referred for higher management.
Conclusions: The differentiated TB care resulted in favourable outcome in the intervention cohort. Implementation of same across the country is crucial strategy for reduction in TB deaths.

EP36-1045-20 Predictive analysis of all-cause mortality of initial-treated people with pulmonary TB complicated by hypertension

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Background: To investigate the risk factors for all-cause mortality of initial-treated pulmonary tuberculosis patients complicated by hypertension and construct a predictive model.
Design/Methods: We conducted a retrospective analysis of the clinical data of inpatients with initial-treated pulmonary tuberculosis complicated by hypertension from 2019 to 2021 in Changsha Central Hospital. Patients' survival status and cardiovascular events were collected through telephone follow-up. LASSO regression was utilized to screen predictive variables, and binary logistic regression identified mortality risk factors. A predictive nomogram model was developed utilizing R software and subsequently verified for precision and dependability.
Results: Among the 1,014 patients, there were 100 (9.86%) deaths and 82 (8.09%) cardiovascular events. LASSO regression screened out 13 predictive variables. Multivariate logistic regression analysis revealed that smoking history, sputum bacteriology, pleural effusion, coronary heart disease, and chronic kidney disease were independent risk factors. Based on the training set data, a nomogram prognostic model was developed, showing an AUC of 0.712 (95% CI: 0.777-0.847), with 50.0% sensitivity and 84.3% specificity. The model's fit was confirmed through internal and external validations.

Conclusions: The prediction model constructed in this study has high predictive ability and satisfactory clinical efficacy, and can provide an effective individualized prediction tool for assessing all-cause mortality risk in patients with initial-treated pulmonary tuberculosis complicated by hypertension.

EP36-1046-20 Associations between mental health diagnoses and prior TB infection among community members in Eastern Cape Province, South Africa

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Background: South Africa is one of the top eight countries globally burdened by tuberculosis. Many factors are associated with tuberculosis infection including clinical, demographic, and modifiable risk factors. Mental health includes a wide variety of disorders, but studies associating them with tuberculosis commonly focus on depression alone.
Design/Methods: A community household survey was conducted June 2022 through January 2023 in East London, Eastern Cape Province, South Africa, as a part of a multi-level study of social determinants and tuberculosis outcomes. Heads of households (HoH) from 93 study communities were surveyed. The presence of a mental health condition was defined as at least one self-reported mental health diagnosis (depression, anxiety, PTSD, bipolar disorder, panic, suicidality, alcohol/substance use disorder, or schizophrenia). Logistic regression was performed to determine the associations of mental health on prior tuberculosis infection, adjusting for demographic and socioeconomic factors.
Results: Among 3,869 HoH surveyed, 10.6% reported ever having tuberculosis, and 5.6% reported a mental health diagnosis. Depression was the most commonly reported mental health diagnosis (2.1%) followed by alcohol/substance use disorder (0.7%). Having any mental health diagnosis was associated with prior tuberculosis (OR=2.226, 95% CI: 1.551-3.195) after adjusting for confounders. Both alcohol/substance use disorder (OR = 4.550, 95% CI: 2.052, 10.085) and depression (OR = 2.039, 95% CI: 1.121, 3.709) were individually associated with prior tuberculosis in logistic regression models as the sole mental health disorder. Fisher exact tests for PTSD (0.21%) and bipolar disorder (0.26%) were also significant, but with such a small sample size additional analyses were unreliable. Being older, male, lower income, and lower education were associated with prior tuberculosis.
Conclusions: Mental health diagnoses are often underreported and vary widely in their biological, immunological, and behavioral characteristics. Further research is warranted on the association of individual disorders on tuberculosis infection.

EP36-1047-20 Computer-aided detection of cardiomegaly during TB screening: Prevalence and association with hypertension

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Background: The burden of uncontrolled hypertension is substantial across sub-Saharan Africa. Computer-aided detection (CAD) software for TB screening can estimate the cardiothoracic ratio, which may identify individuals at risk of uncontrolled hypertension. There is potential to integrate hypertension screening, guided by CAD-interpreted cardiothoracic ratios, into large-scale TB screening activities, but this approach has not been evaluated.
Design/Methods: We conducted X-ray-based TB screening in peri-urban and rural Uganda using CAD software interpretation (qXR v3; Qure.ai). The software was programmed to indicate cardiomegaly when posteroanterior chest X-rays had cardiothoracic ratios >0.6.
All participants with CAD-interpreted cardiomegaly ("cardiomegaly") were offered blood pressure screening; other participants were offered blood pressure screening on request.
We estimated the prevalence of cardiomegaly in the screening population and the prevalence of hypertension among participants with and without cardiomegaly.
Results: We screened 87,998 individuals aged ≥15 years for TB using CAD-assisted chest X-ray between November 2022 and March 2025. CAD identified 10% (8,732) of TB screening participants as having cardiomegaly. Among participants with cardiomegaly, 49% (3,632/7,447) had elevated blood pressure (systolic ≥140 mmHg or diastolic ≥90 mmHg), versus 17% (1,152/6,768) of participants without cardiomegaly who requested blood pressure measurement ($p<0.01$).
The prevalence of severely elevated blood pressure (systolic ≥180 mmHg or diastolic ≥110 mmHg) was 12% (895/7,447) versus 3% (195/6,768). Of participants with cardiomegaly and elevated blood pressure, only 23%

(337/1,486) reported taking anti-hypertensive medications (Table). CAD-interpreted cardiomegaly was more common in women than in men (13% vs. 5%, $p<0.01$), but among those with cardiomegaly, the prevalence of elevated blood pressure did not differ by sex (49% vs. 48%, $p=0.53$).

	CAD-interpreted cardiomegaly (n=7,447)	No CAD-interpreted cardiomegaly (n=6,768[x])	p-value[#]
Age in years, median (IQR)	51 (40-63)	38 (26-50)	<0.01
Male sex, n (%)	1,758 (24%)	3,426 (51%)	<0.01
Elevated blood pressure, n/N (%) (systolic ≥140mmHg and/or diastolic ≥90mmHg)	3,632 (49%)	1,152 (17%)	<0.01
Severely elevated blood pressure, n/N (%) (systolic ≥180mmHg and/or diastolic ≥110mmHg)	895 (12%)	195 (3%)	<0.01
Hypertension diagnosis and treatment status[†], n/N (%)			
Known hypertension, on treatment	337/1,486 (23%)	159/1,200 (13%)	
Known hypertension, not on treatment*	531/1,486 (36%)	346/1,200 (29%)	<0.01
No known hypertension	618/1,486 (42%)	695/1,200 (58%)	

[x] Of 80,551 participants without cardiomegaly, 6,768 requested and underwent blood pressure measurement.
[#] By chi-squared test
[†] Hypertension treatment history was collected from a subset of consecutive participants who underwent blood pressure measurement.
* Had not taken any anti-hypertensives in the past 4 weeks.

Conclusions: CAD identified a high burden of undetected cardiomegaly and associated untreated hypertension among TB screening participants in Uganda. Integrating cardiomegaly assessment into CAD-based TB screening has the potential to aid early detection of cardiovascular disease.

EP36-1048-20 Clinicopathological features and diagnostic challenges in concurrent intestinal TB and colorectal cancer: A retrospective cohort study from a TB-endemic region

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Background: The coexistence of intestinal tuberculosis (ITB) and colorectal cancer (CRC) poses significant diagnostic challenges due to overlapping symptoms and histopathological complexities, particularly in tuberculosis-endemic regions. Despite their individual global health burdens, the clinicopathological interplay of ITB-CRC comorbidity remains poorly characterized, contributing to delayed diagnoses and adverse outcomes. This study aims to elucidate the clinical, endoscopic, and histopathological features of concurrent ITB-CRC to improve diagnostic accuracy and therapeutic strategies.

Design/Methods: A retrospective cohort analysis was conducted on nine histopathologically confirmed ITB-CRC cases at Changsha Central Hospital (2012–2022). ITB diagnosis required caseating granulomas with Langhans giant cells, acid-fast bacilli positivity, or TB-DNA PCR. CRC was confirmed via hematoxylin-eosin staining and immunohistochemistry (CK20/CDX2). Exclusion criteria included metachronous post-treatment diagnoses of either condition. Clinical, laboratory, imaging, endoscopic, and therapeutic data were analyzed descriptively under ethical approval.

Results: The cohort (male predominance: 77.8%; median age: 68 years) presented nonspecific symptoms: abdominal pain (77.8%), weight loss (44.4%), and anorexia (44.4%). Concurrent pulmonary tuberculosis (77.8%), universal inflammatory marker elevation (ESR/CRP), anemia (55.6%), and hypoalbuminemia (55.6%) were prevalent. Elevated preoperative CEA (6/8) correlated with advanced CRC stages. Imaging revealed bowel wall thickening (100%) and abdominal masses (33.3%). Colonoscopy detected ulcerative lesions (71.4%), with biopsy confirming adenocarcinoma (5/7) or cytological atypia (2/7). ITB-CRC colocalized in the ascending colon (33.3%), all histologically adenocarcinoma. Surgical resection (77.8%) combined with anti-tuberculosis therapy (66.7%) was primary management. Mortality reached 33.3% in untreated patients, while ATT intolerance (11.1%) and non-compliance (22.2%) worsened outcomes.

Conclusions: ITB-CRC comorbidity presents with nonspecific symptomatology, necessitating heightened clinical suspicion in elderly patients. Endoscopic-histopathological integration is critical for differentiation in endemic regions. Multidisciplinary strategies combining ATT and oncological interventions are imperative to mitigate diagnostic delays. Despite limitations (small sample size, retrospective design), this largest regional case series highlights the need for context-specific diagnostic algorithms to optimize outcomes in dual-pathology cases.

EP36-1049-20 Substance use prevalence during TB treatment: A systematic review and meta-analysis in the African region

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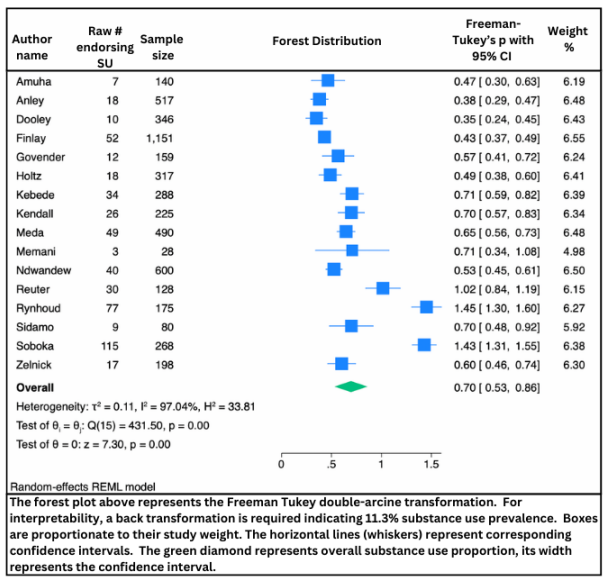
Background: There are several reviews evaluating alcohol use and tuberculosis (TB), but analyses with other types of substance use (SU) are lacking. Our aim was to systematically review and summarize the prevalence of illicit SU among people with TB and to synthesize the impact of SU on TB outcomes in Africa. Our secondary aim was to characterize methods of SU measurement in TB research.
Design/Methods: We systematically searched PubMed, Embase and CINAHL to identify relevant articles. Using the PRISMA method, two individuals reviewed texts for inclusion, a third author resolved disagreements. We included peer-reviewed research conducted in Africa that evaluated prevalence of substance use among people with TB and correlated SU with a TB related outcome. To stabilize variance of proportion in SU prevalence we used the Tukey-Freeman double-arcine transformation with a restricted maximum-likelihood random-effects model.



The forest plot above represents the Freeman Tukey double-arcine transformation. For interpretability, a back transformation is required indicating 11.3% substance use prevalence. Boxes are proportionate to their study weight. The horizontal lines (whiskers) represent corresponding confidence intervals. The green diamond represents overall substance use proportion, its width represents the confidence interval.

Results: 19 studies conducted between 2006-2024 were included, representing 5,475 participants. Most studies were conducted in South Africa (n=9) and Ethiopia (n=6); all used self-reported SU data and primarily measured khat/marijuana use. No studies evaluated opiate use. SU prevalence ranged from 3-48% across studies with an estimated pooled prevalence of 11.3% using 17/19 studies. 14 studies evaluated a relationship between substance use and TB care engagement with conflicting results. Heterogeneity prevented a pooled estimate of effect size. Most studies evaluated SU as a dichotomous variable. Two studies that used a validated instrument yielded considerably higher endorsement of SU.
Conclusions: Studies were split on whether SU significantly affected TB care engagement. Some variability in these findings is likely attributable to heterogeneous definitions of SU and in SU data collection. To ascertain the true prevalence of SU during TB treatment and to rigorously evaluate correlations between SU and care engagement, we must capture the spectrum of SU from beneficial to harmful use and differentiate between categories of substances.

EP36-1050-20 Double burden of mental health issues and TB among people with drug-sensitive and drug-resistant TB in rural India

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Background and challenges to implementation: Beyond its physical health implications, TB may impact mental well-being, leading to increased rates of anxiety, depression and social stigma among affected individuals. To improve the well-being and treatment success in people with susceptible TB (PwDSTB) and people with drug-resistant TB (PwDRTB), we need to address both physical and psychological needs through comprehensive care strategies.
Intervention or response: In an active case-finding intervention from November 2023 to December 2024, 18+ yrs Person with TB (PwTB) screened for mental health issues in rural Bihar using the WHO "**Self-Reporting Questionnaire (SRQ-20)**". This 20-item tool assesses cognitive themes (difficulty in thinking, decision-making, daily activities), somatic themes (frequent headaches, loss of appetite, digestive issues, sleep disturbances), severe anxiety and depression themes (feelings of fear, sadness, worthlessness, suicidal thoughts). PwTB scoring over 15 or reporting suicidal tendencies were considered screening

positive. Collected data of PwTB screened positive were analyzed to determine the prevalence of mental health issues.

Results/Impact: Among 397 PwDSTB, 209 (53%) females, 188 (47%) males and among 122 PwDRTB, 42 (34%) females, 80 (66%) males were identified with mental health issues. Notably, 48% of PwDSTB and 72% of PwDRTB with mental health issues were young adults (18–39 years old).

Thematic analysis was done for PwTB reporting all symptoms from each category. In PwDSTB, 69 (17%) reported somatic symptoms, 90 (23%) had cognitive symptoms,104 (26%) experienced severe depression and anxiety. In PwDRTB, 46 (38%) reported somatic symptoms, 56 (46%) had cognitive symptoms, 52 (43%) experienced severe anxiety and depression.

	Mental Health Issues among DSTB			Mental Health Issues among DRTB		
Themes	Somatic Symptoms n=69	Cognitive Symptoms n=90	Severe Anxiety and Depression symptoms n=104	Somatic Symptoms n=46	Cognitive Symptoms n=56	Severe Anxiety and Depression symptoms n=52
Female	41 (59%)	49 (54%)	69 (66%)	17 (37%)	19 (34%)	22 (42%)
Male	28 (41%)	41 (46%)	35 (34%)	29 (63%)	37 (66%)	30 (58%)

Table. Thematic analysis of Mental health issues among PwTB

Conclusions: This study found that PwDRTB more often reported somatic, cognitive and severe anxiety and depression symptoms than PwDSTB. Prevalence of symptoms of severe depression and anxiety were more amongst females (DSTB-69%, DRTB-42%) and young adults (DSTB-58%, DRTB-77%) than cognitive symptoms and somatic symptoms. This highlights the need for gender and age-sensitive interventions to improve TB treatment outcomes.

EP36-1051-20 Empowering adults with TB in Indonesia through a community-based, peer-led psychosocial support intervention to reduce stigma and depression: A qualitative study from the TB-CAPS project

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Background: Working with multisectoral stakeholders, we co-developed "TB-CAPS": a community-based, peer-led psychosocial support intervention consisting of individual counselling and tuberculosis (TB) survivor-led group sessions. The intervention was implemented in two Indonesian cities with high TB burden: Padang and Depok.

This study evaluated the acceptability and scalability of the intervention from the perspective of people with tuberculosis who had participated.

Design/Methods: A qualitative study with a phenomenological approach was conducted with participants who received our community-based, peer-led TB-CAPS psychosocial support intervention. We purposively invited: participants who had attended TB-CAPS intervention activities to focus group discussions (FGD); and participants who had minimal engagement with activities to in-depth interviews (IDIs). We applied thematic analysis using MAXQDA24 software.

Results: A total of 16 people with TB participated in two FGDs (13 people) and 3 people in in-depth interviews. Key themes that emerged were:

1. Empowerment through adequate information;
2. Motivation to complete treatment from peers' shared experiences and support;
3. Support [IFP1] for wider scale-up of the TB-CAPS intervention.

The intervention was reported to reduce self-stigma and empower participants through information sharing. The participants expressed that the individual and group counselling gave participants the chance to ask more questions, thus addressing their concerns. The support they received from peers in the group sessions were a motivation to complete treatment and be 'free' of tuberculosis. The benefits and knowledge obtained made participants supportive and willing to contribute to the scale-up of the TB-CAPS intervention to reach more people with TB.

Conclusions: Community-based, peer-led psychosocial support, which combined individual and monthly group counselling, was well received among adults with TB in Indonesia. The intervention was considered beneficial and scalable. A randomized-controlled trial evaluation to evaluate the effectiveness and cost-effectiveness of the TB-CAPS intervention at scale in Indonesia is planned.

EP36-1052-20 Pharmacokinetics of concomitant drug-resistant TB and hepatitis C treatment in Georgia: Preliminary results from the DARE TB/HCV study

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Background: High prevalence (2-27%) of hepatitis C virus (HCV) coinfection among drug-resistant tuberculosis (DR-TB) patients in Eastern Europe and Central Asia necessitates evidence-based guidelines for concomitant treatment.
Currently, no data exists on pharmacokinetics (PK) of anti-TB drugs and direct-acting antivirals (DAAs) for HCV when administered simultaneously.
Design/Methods: A prospective PK study enrolled DR-TB patients receiving oral anti-TB drugs – bedaquiline (Bdq), pretomanid (Pa), linezolid (Lzd), with or without moxifloxacin (Mfx) – concomitantly with HCV DAAs – sofosbuvir (SOF) and velpatasvir (VEL).
We aimed to evaluate PK parameters of anti-TB drugs administered before and after initiating HCV treatment, and PK parameters of DAAs among DR-TB patients, with serial serum samples collected at baseline, 2, 6, 12, and 24-hours post-drug administration. Serum drug concentrations were measured using High-Performance Liquid Chromatography/Mass Spectrometry (HPLC-MS).
Results: Seven patients (mean age 54, 6 males, 6 smokers) were included. Six patients initiated anti-TB treatment first, followed by DAAs ~1 month later. Baseline liver fibrosis stages were advanced (F3 or cirrhosis) in 5 participants. All 7 participants achieved a negative HCV RNA viral load post-treatment; available sustained virologic response (SVR) at 6 months was 100% (3/3). All 7 participants had a favorable (cured/completed) TB treatment outcome.
Mean anti-TB drug concentrations for the five patients assessed thus far pre- and post-DAA initiation, where as follows (Cmax, mcg/mL): Bdq – 1.42/0.86, Pa – 2.42/2.83, Lzd – 6.75/11.16, and Mfx – 1.69/2.40, respectively. After initiation of DAAs (SOF mean C_{max} – 1 mcg/mL [VEL–under analysis]), preliminary PK data suggested comparable serum concentrations for all anti-TB drugs, indicating no significant immediate drug-drug interactions affecting anti-TB drug levels. Complete PK parameters are currently under analysis.
Conclusions: Preliminary PK analyses indicate successful outcomes for concomitant DR-TB and HCV treatment without significant interactions. This study provides essential clinical pharmacology data informing future TB/HCV treatment guidelines and supports expanding the regional co-treatment initiative.

EP37 Beyond the cure: Addressing TB sequelae, relapse and reinfection in long-term health

EP37-1053-20 Evaluation of sequalae after treatment completion in people with pulmonary TB in Bamako, Mali

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Background: Tuberculosis (TB) is a chronic, contagious infection with a very favorable course of treatment, but the after-effects are frequent and can threaten the patient's functional or even vital prognosis. These sequelae can give rise to co-morbidities that have a negative impact on patients' social, mental and professional lives.
The aim of this study was to evaluate TB sequelae by chest x-rays and spirometry in patients who had completed TB treatment in Bamako
Design/Methods: This was a pilot study conducted at the University Clinical Research Center (UCRC) from November 2023 to January 2024. The study population consisted of previously pulmonary TB treated patients 7-10 years ago. Each patient provided a sputum and blood for culture, Xpert MTB/RIF and biochemical tests respectively. Sequelae were evaluated with chest X-rays and spirometry.
Results: Of the 966 TB patients (with and without HIV) which were followed between 7-10 years after treatment completion, 72 were evaluated. The mean age was 42.01±12.07 years, and all had negative culture and negative Xpert MTB/RIF results. Based on the American Thoracic Society (ATS)-definition, 63(87.5%) had abnormal lung function, of whom 28 (44.4%) were categorized as obstructive, 25(39.7%) as restrictive, and 10(15.9%) as mixed (obstructive and restrictive) at spirometry.
In addition, biochemical parameters showed elevated transaminase (ALT, AST) and creatinine levels at 28.8% and 8% respectively. Moreover, questions relating to mental and physical health showed that 16.4% and 23.3% of our participants had experienced jaundice and edema since the TB episode, and over 60% complained of fatigue, breathing difficulties and nervousness.
Conclusions: This preliminary study shows that although underreported, many TB cured patients in Mali have impactful lung damage leading to sequela and a poor quality of life. A large study involving concomitant and previously treated patients is needed to evaluate the appearance and the early management of these sequelae.

EP37-1054-20 Post-TB lung function among adults screened for chronic obstructed pulmonary disease in Nepal, Peru and Uganda: A post-hoc analysis of the GECO study

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Background: Prior tuberculosis is an important risk factor for chronic airflow obstruction. Whether individuals have lung function impairment prior-to or after tuberculosis and associated risk factors remain unclear. In a post-hoc analysis of the Global Excellence in COPD Outcomes (GECo) study of COPD case-finding in Nepal, Peru, and Uganda, we examined the association between previous TB and chronic respiratory disease (CRD) as well as the relative timing of lung function impairment and tuberculosis.
Design/Methods: Participants were screened for COPD using questionnaires followed by post-bronchodilator spirometry. COPD was defined as FEV_1 to FVC ratio less than the fifth percentile of the GLI mixed-ethnic population reference lower limit of normal. Data on self-reported long-term conditions and time since diagnosis were collected. We used logit regression models to compare the odds of COPD in those with previous treated tuberculosis versus those without.
Results: Among 10,648 study participants, the prevalence of previous tuberculosis was 4%(n=430); COPD was 9%(n=993) and CRD 5%(n=534). Median age at tuberculosis diagnosis was 32 (IQR 23-45) years.
Among those with previous TB, 12% (53/430) had been diagnosed with CRD. Of those with TB and CRD, 25%(13/53) were diagnosed with CRD before TB, and 75%(40/53) with TB before developing CRD. Median time to CRD diagnosis after TB was 20 years (IQR: 8-27). After adjusting for age, sex, time since diagnosis with TB, and smoking status, individuals with previous tu-

berculosis had a 2.45 (95% CI: 1.89-3.19) times greater odds of COPD compared to those without. Respiratory lung function and symptoms were associated with COPD among those with previous TB.
Conclusions: Prior TB diagnosis is a significant predictor of COPD among this diverse Global South population. Further analyses of risk factors and other long-term conditions will provide valuable insights.

EP37-1055-20 Post-TB chronic pulmonary aspergillosis: Phenotypic heterogeneity and independent predictors of adverse treatment outcomes

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Background: Post-tuberculosis chronic pulmonary aspergillosis (Post-TB CPA) represents a clinically prevalent comorbidity and imposes a substantial burden across tuberculosis-endemic regions. The study aimed to delineate the clinical phenotypes of post-TB CPA patients and identify independent predictors of adverse treatment outcomes.
Design/Methods: We retrospectively analyzed post-TB CPA patients admitted to Hangzhou Red Cross Hospital between January 2020 and December 2023. Patients were categorized into two groups based on clinical outcomes after 12 months follow-up. Logistic regression was used to identify independent predictors of adverse treatment outcomes.

Risk Factors	Odds ratio (95% CI)	P Value
Surgery	0.735(0.132~4.08)	0.724
Antifungal Treatment > 3 Months	0.038(0.003~0.431)	0.008
SAIA	14.356(2.923~70.504)	0.001
ESR > 30mm/h	5.276(1.505~18.491)	0.009
Pulmonary Fibrotic Lesions	5.03(1.437~17.612)	0.012

ESR-Erythrocyte Sedimentation Rate; SAIA:Subacute Invasive Pulmonary Aspergillosis

Table. Logistic Regression Analysis of Predictors of Adverse Treatment Outcomes in Post-Tuberculosis CPA Patients.

Results: A total of 109 patients with post-TB CPA were included. Adverse treatment outcomes occurred in 33.9% (37) of patients. Subacute invasive pulmonary aspergillosis (*OR* = 14.356, 95% *CI*: 2.923–70.504, *P* = 0.001), elevated erythrocyte sedimentation rate (*OR* = 5.276, 95% *CI*: 1.505–18.491, *P* = 0.009), and pulmonary fibrosis (*OR* = 5.03, 95% *CI*: 1.437–17.612, *P* = 0.012) were independent predictors of poor outcomes. Antifungal treatment ≥ 3 months significantly reduced progression risk (*OR* = 0.038, 95% *CI*: 0.003–0.431, *P* = 0.008). Surgery showed a protective effect in univariate analysis but not after adjustment for confounders.
Conclusions: Post-TB CPA poses a significant threat to long-term respiratory health. Early identification of high-risk patients and ensuring at least 3 months of antifungal therapy may improve outcomes.
These findings underscore the need for structured post-TB follow-up to improve health and well-being after TB cure.

EP37-1056-20 Identifying gaps in post-TB screening through a comparative study of national guidelines in high-burden countries: A scoping review

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Background: Recurrent tuberculosis (TB) and post-TB lung disease (PTLD) are important threats to TB survivors in high burden settings. Recurrent TB represents a significant proportion of incident TB cases globally, and up to two-thirds of TB survivors are estimated to develop PTLD. However, these estimates are likely inaccurate due to lack of screening, or screening with sub-standard methodologies.
This scoping review aimed to summarize and identify gaps in screening guidelines for both recurrent TB and PTLD, as well as management guidelines for PTLD.
Design/Methods: We reviewed the most recent versions of publicly available national TB guidelines from the 30 high burden countries as defined by the World Health Organization.
We conducted full-text reviews of each guideline, extracted data on the methodology, frequency and duration of post-TB follow-up and PTLD management, and compared recommendations across countries. We used computer-aided translation for non-English guidelines.
Results: We identified 20 high burden countries with publicly available national guidelines on post-TB interventions.
Few countries (n=6) recommended routine screening for recurrent TB detection in the first 12 months following treatment completion (Table).
When guidelines were present, they were primarily for drug resistant TB (DR-TB) survivors. References to PTLD were rare (n=2) and lacked detail on diagnosis, follow-up, or clinical management.
Guidelines for two countries, Ethiopia and South Africa, had clear protocols for PTLD management, in addition to recurrent TB screening.

Country	Patient profile	Screening methodology	Duration	Frequency	PTLD follow up recommendation
Ethiopia	DR-TB	Symptom assessment, sputum smear microscopy and culture, DST is symptomatic, chest x-ray if clinically indicated	12 months	3rd, 6th, 12th month after treatment completion	Screen, diagnose and manage if any of post TB sequalae are developed
India	DR-TB	Symptom assessment, chest x-ray, smear microscopy/culture if symptomatic	24 months	Every 6 month after treatment completion	No
Myanmar	DR-TB	Symptom assessment, sputum smear microscopy and culture, chest x-ray, DST if culture positive	24 months	Every 6 month after treatment completion	No
Namibia	DR-TB	Symptom assessment, sputum microscopy and culture	12 months	Every 3 months after treatment completion	No
Philippines	DR-TB	Symptom assessment, chest x-ray, smear microscopy and culture	12 months	Every 6 month after treatment completion	No
South Africa	DR-TB	Symptom assessment, sputum smear microscopy and culture	12 months	Every 6 month after treatment completion	Functional respiratory assessment and long term follow up by pulmonary services in tertiary centers.

Table detailing post-TB follow-up recommendation and PTLD management

Conclusions: Findings indicate a need for national TB programs to adopt structured, inclusive post-treatment monitoring policies for both drug-sensitive and drug-resistant TB. Incorporating PTLD and recurrent TB screening and management into such programs would likely lead to improvements in patient outcomes.

EP37-1057-20 Optimising active detection of recurrent TB: An individual-based modelling analysis informed by Indian cohorts

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Background: People recently treated for TB face substantial risk of recurrence. Active case-finding (ACF) is recommended, but the optimal timing and approach are uncertain.

Design/Methods: We developed an individual-based model of people recently treated for TB in India, informed by cohort data on recurrent TB: incidence, symptoms, and predictive accuracy in the TB Aftermath trial and asymptomatic recurrence in earlier studies (CTRIUMPh and TBDM). The model represented the timing, symptoms, sputum NAAT positivity, and routine diagnosis of recurrent TB. Within 1000 simulated cohorts (representing parameter uncertainty) of 100,000 patients each, we modeled symptom screening at specified times after treatment completion, and considered targeting of high-risk individuals and/or addition of NAAT testing.

We estimated months of symptomatic TB and of "infectious" (sputum+, regardless of symptoms) TB averted, compared to no ACF, for cost-equivalent screening options.

Results: Within the simulated cohort, incidence of recurrent TB peaked at 4 (3-5) months post-treatment, and prevalence of undiagnosed symptomatic TB peaked at 6 (5-7) months. The primary intervention – symptom screening at 6, 12, and 18 months – averted 12% (IQR 10-14%) and 11% (9-12%) of time with symptomatic and infectious TB, respectively. Shifting screening earlier (3, 6, and 9 months) detected more TB but did not further reduce time with TB (Table) because it missed people with especially long disease courses in lower-risk time intervals or patient subgroups.

Targeted sputum screening further reduced time with infectious TB, but frequent sputum screening of high-risk patients was more efficient (Table). Impact on time with symptomatic TB nearly doubled if the initial screening visit also improved subsequent care-seeking and passive detection (Table).

Variation of post-treatment active case finding intervention*	Time points (months post treatment)	Included patients†	Screening for asymptomatic TB?	Recurrent TB identified through ACF (per 100,000 patients)	Mean days with symptoms, all recurrent TB	% reduction in time with symptomatic TB	% reduction in time with infectious TB
Primary intervention**	6, 12, & 18	All	No	836 (694, 1006)	30 (26, 35)	12% (10, 14)	11% (9, 12)
Earlier ACF timing	3, 6, & 9	All	No	1056 (900, 1228)	30 (27, 36)	11% (9, 13)	11% (10, 13)
More frequent ACF, risk-targeted	3, 6, 9, 12, 15, & 18	Highest-risk 62%	No	1229 (1020, 1432)	29 (26, 34)	14% (13, 16)	14% (12, 16)
With sputum testing, risk-targeted	6, 12, & 18	Highest-risk 62%	Yes (if high risk)	1118 (930, 1297)	30 (26, 35)	11% (10, 13)	13% (11, 15)
Early sputum testing for high-risk patients; periodic phone screening for all	3 (targeted), 6, 12 & 18	Highest-risk 40% for initial home/sputum visit; all for subsequent phone calls	Yes (if high risk)	916 (766, 1084)	30 (27, 36)	10% (8, 12)	13% (11, 14)
Sensitivity analysis: Intervention improves care-seeking (after a home visit, patients seek passive diagnosis 20% faster indefinitely)	6, 12, and 18	All	No	794 (645, 936)	27 (24, 32)	20% (18, 22)	15% (13, 17)

* For all variations, the first screening time point occurs at home, and later screening is by telephone.
** Based on Aftermath trial intervention
† For targeted interventions, coverage is chosen to match the cost of the primary intervention, and the targeted patients are those with the highest predicted risk based on a prediction model that uses characteristics measurable at the end of their earlier treatment course.

Table: Modeled interventions and key summary outcomes (median and IQR across simulated cohorts)

Conclusions: Screening for recurrent TB could reduce morbidity and transmission. Under resource constraints, risk-targeted symptom screening could be more efficient than universal or non-symptom-gated strategies. Counseling and support to facilitate prompt symptom-driven care-seeking could also reduce time with undiagnosed TB.

EP37-1058-20 Unveiling the dynamics of post-TB recurrence screening among TB healthcare workers in Pune, India: A normalisation process theory perspective

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Background and challenges to implementation: Recurrent tuberculosis (TB) poses hurdles to global TB elimination, necessitating robust post-treatment screening. TB *Aftermath*, a hybrid trial in India, assesses whether phone screening is non-inferior to home-based screening at detecting TB recurrence among TB survivors. This substudy describes healthcare workers'(HCWs) perspective on acceptability of post-TB screening strategies.

Intervention or response: Twelve in-depth interviews were conducted with HCWs from National Tuberculosis Elimination Program (NTEP) and those hired from TB aftermath study across six tuberculosis units (TUs). Thematic analysis, guided by four constructs of Normalization Process Theory (NPT) viz., coherence, collective action, cognitive participation & reflexive monitoring, examined how home-based and phone screening are integrated into routine practice.

Results/Impact: All HCWs expressed coherence describing their roles specific to intervention. They recognized the significance of screening in reporting recurrent cases. HCWs prioritized home-based over phone screening emphasizing direct symptom identification. They acknowledged phone screening practical, being less resource-intensive yet effective in identifying symptomatic patients.
Engagement of NTEP staff with TB survivors and household contacts was facilitated by pre-established rapport. Most HCWs expressed strong commitment with both the screening intervention, recognizing its impact on early recurrence identification. Both strategies were seamlessly integrated into daily activities of NTEP staff, with study staff often supporting the process.
Integration of home-based screening into routine workflows were taxing due to time constraint. Despite contact tracing, data entry in Nikshay digital portal, aligning visits as per patients' availability, mobile connectivity, stigma and geographical constraints, HCWs recognized the effectiveness of systematic recurrence screening through structured workflows. Study staff supported with consistent patient engagement. Thus, NTEP HCWs emphasized need for additional manpower, resources and incentives for sustainable scale-up in healthcare system.

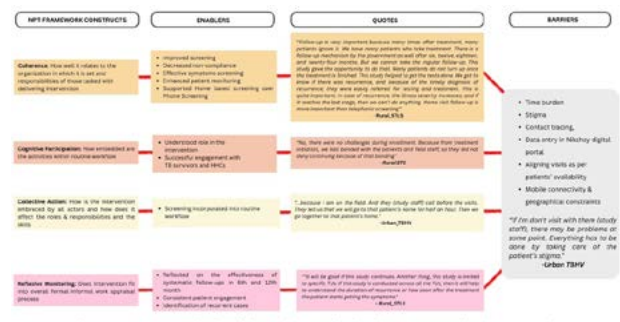

Figure 1: NPT Framework Identifying Enablers and Barriers in Home-Based & phone screening

Conclusions: HCWs effectively integrated post-TB screening into routine practice, despite constraint they had study staff as additional manpower. Strengthening organizational support, optimizing workflows, addressing structural barriers are critical for scalability and sustained impact.

EP37-1060-20 Assessment of TB reinfection rates among previously treated people in Nigeria (October 2022 – June 2024): Implications for targeted intervention strategies

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Background and challenges to implementation: Tuberculosis (TB) reinfection among previously treated patients is a significant public health challenge, particularly in high-burden regions like Nigeria. Reinfection could result from continued exposure to the disease. Understanding the rate of reinfection among previously treated patients is vital to improving TB control strategies.
The objective is to determine TB reinfection and DRTB infection rates in people who have completed TB treatment in Benue State, Nigeria
Intervention or response: This retrospective cross-sectional study was conducted from October 2022 to June 2024 in Benue State, Nigeria, using community awareness campaigns to identify the people who had previously completed TB treatment. A total of 1,062 previously treated TB patients were identified. Their sputum samples were collected and tested using GeneXpert MTB/RIF assays to detect Mycobacterium tuberculosis (MTB) and rifampicin-resistant TB (DRTB). Descriptive statistical analysis was used to determine the rate of reinfection and drug-resistant strains.
Results/Impact: Of the 1,062 previously treated TB patients identified, 185 (17.4%) were reinfected with MTB, and 15 (1.4%) were diagnosed with DRTB. The results indicate a considerable reinfection rate.
Conclusions: The findings underscore the need for enhanced intervention strategies aimed at reducing TB reinfection rates among previously treated patients. Strengthened follow-up protocols and community-based infection control measures, coupled with public awareness campaigns, are essential in addressing reinfection risks and preventing the spread of drug-resistant TB.

EP38 Uniting forces: Collaborative strategies and policies driving TB progress

EP38-1061-20 Sustaining the lifeline: Empowering counties to drive costed integrated specimen referral plans for TB diagnostics

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Background and challenges to implementation: Timely diagnosis is essential for effective TB control in Kenya. However, many counties face challenges due to fragmented and under-resourced specimen referral systems. Amid declining donor support, there is an urgent need for counties to adopt sustainable, locally driven solutions. In response, Amref Health Africa, in collaboration with the Ministry of Health, supported the development of County-Specific Operational Plans (CSOPs), tailored to each county's diagnostic capacity, transport systems, and resource availability for effective implementation of the Integrated Specimen Referral System (ISRS).
Intervention or response: A structured operational assessment was conducted across all 47 counties. A standardized data collection tool was developed and administered by trained County and Sub-County Medical Laboratory Coordinators. Data collected included facility mapping, TB diagnostic capacity, equipment functionality, human resource availability, laboratory operational hours, transport routing, vehicle and motorbike requirements, inter-facility distances, and projected operational costs. The data were validated and analyzed to generate costed, context-specific ISRS designs for each county.
Results/Impact: Fifteen counties have developed tailored CSOPs for ISRS implementation. Of these, two counties have allocated budget lines and procured motorbikes for TB specimen transport. Eleven diagnostic sites were earmarked for upgrading from spokes to hubs to expand testing capacity and reduce referrals. Additionally, 80% of non-functional diagnostic equipment were repaired in preparation for implementation. Encouraged by this model, local implementing partners have initiated CSOP development in the remaining 32 counties, generating momentum for national scale-up.
Conclusions: County-led development of costed ISRS models through CSOPs presents a scalable, sustainable approach to strengthening TB diagnostic networks in resource-constrained settings. This model promotes government ownership, enhances resilience beyond donor cycles, and supports equitable access to timely TB diagnosis across Kenya and other high-burden LMICs.

EP38-1062-20 Improving TB detection in vulnerable urban populations through integrated health services: Evidence from two districts in Greater Accra, Ghana

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Background and challenges to implementation: A major challenge to TB control in Ghana is low case detection, mainly due to passive case-finding methods. This intervention aimed to enhance TB detection in high-risk slum areas of Greater Accra, Ghana through active case-finding and integrated health services.

Intervention or response: Integrated community-based active TB case-finding activities were carried out among slum and ghetto dwellers in the La Dadekotopon and Korle Klottey districts of the Greater Accra Region, Ghana. The intervention combined TB screening with HIV testing, malaria testing, blood sugar and blood pressure checks, and employed a mobile X-ray van to facilitate on-the-spot TB diagnosis. To encourage participation, free insecticide-treated bed nets (ITNs) were distributed to all people screened.

The screening activities were led by ten nurses from ART clinics and DOTS centres, with support from two radiographers who operated the X-ray machine. Six TB Champions were deployed to support community mobilization efforts, which were further strengthened through announcements via community information centers and mobile vans. Data on attendance, presumptive TB cases based on radiological, bacteriological and clinical diagnosed cases were collected and analysed.

Results/Impact: A total of 1,243 individuals were screened, with 894 identified as presumptive TB cases. Of these, 546 sputum samples were collected, and 347 individuals undertook chest X-ray. 26 X-rays were suggestive of TB, and 87 individuals were bacteriologically confirmed as TB positive by GeneXpert MTB. All confirmed cases were initiated on treatment.

This integrated approach significantly reduced diagnostic delays and improved case detection among high-risk groups. Community mobilisation through peer leaders and ghetto influencers contributed to turnout and enhanced local ownership of the TB response.

Conclusions: The integrated, community-based TB screening approach proved effective in enhancing case detection among urban marginalised populations. By combining health services and leveraging peer-led mobilisation, the intervention reduced diagnostic delays, improved access to care and early TB treatment initiation.

EP38-1063-20 Evaluating community-based initiatives on TB knowledge and attitude in Nasarawa, Nigeria: A machine learning comparison of survey responses

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Background: Nigeria continues to face insufficient Tuberculosis (TB) knowledge which poses a barrier to successful healthcare initiatives. Research shows that community involvement through trained volunteers and local networks significantly boosts Tuberculosis knowledge and reduces stigma.

A community-based initiative in Nasarawa State worked to correct TB misconceptions through collaboration with market leaders along with religious leaders and community members. Insights from the baseline survey directed the Local Tuberculosis Action Group (LTAG) to launch specific initiatives. A follow-up survey assessed changes in community awareness and perceptions.

We used machine learning models to analyze response shifts to evaluate the changes more effectively. The research examines TB initiative effects in two Local Government Areas (LGAs) and demonstrates how data-driven methods can assess public health results.

Design/Methods: This cross-sectional study surveyed 3,333 households during baseline and endline in Karu and Keffi LGAs. The data analysis stage included exploratory data analysis followed by data preprocessing and model training with Naïve Bayes, Logistic Regression, Decision Tree, and Random Forest algorithms. The evaluation of model performance used accuracy, precision, recall, and Receiver Operating Characteristics- Area Under the Curve (ROC-AUC) scores.

Results: The study results show considerable advancements in TB awareness and perception after the program implementation. The Random Forest algorithm achieved superior predictive accuracy, AUC and recall score with a 31.67% rise in knowledge and attitude scores from baseline to endline assessments.

The endline assessment revealed substantial performance gains for all models as evaluation metrics rates surpassed 95%, confirming the success of targeted community initiatives.

S/N	Algorithm	Accuracy (Baseline)	Accuracy (Endline)	AUC (Baseline)	AUC (Endline)	Precision (Baseline)	Precision (Endline)	Recall (Baseline)	Recall (Endline)
1.	Naïve Bayes	65.45	95.74	70.57	98.71	73.96	98.98	69.05	96.17
2.	Logistic Regression	64.66	96.80	71.30	98.23	75.76	98.99	64.08	97.38
3.	Decision Tree	63.14	97.69	69.11	98.02	75.21	99.39	61.53	97.99
4.	Random Forest	67.15	98.82	72.37	99.82	74.17	99.14	73.85	99.53

Conclusions: The implementation of community-based initiatives led to substantial improvements in TB knowledge and attitudes among participants. The Random Forest machine learning model demonstrated its capability in assessing public health awareness changes and affirmed its usefulness for intervention evaluations. The study demonstrates that utilizing data-driven methods enhances TB response strategies for improved public health evaluation.

EP38-1065-20 Words matter: Caregiver-health worker communication when using paediatric TB treatment decision algorithms

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Background: Childhood tuberculosis (TB) remains a significant threat in sub-Saharan Africa, often going undiagnosed. To tackle this, the WHO developed Treatment Decision Algorithms (TDAs) that prioritize clinical evaluations and rely on effective communication between health workers (HWs) and caregivers.
This qualitative study aims to understand the communication experiences of caregivers and HWs during TDA implementation for children living with HIV (CLHIV) in Guinea, and for malnourished children in Niger.
Design/Methods: We conducted 50 interviews with caregivers of children with presumptive TB (25 CLHIV and 25 malnourished), and 11 interviews and 4 focus group discussions with HWs involved in TDA implementation. Critical discourse analysis was applied considering subjects' identities, their positions in the care pathway and comparisons across patient groups, healthcare facilities, and national contexts.
Results: Results revealed differing social dynamics in how HWs and caregivers perceive their roles. In Niger, HWs noted that TDA use was limited by communication barriers with caregivers, and some expressed stigmatizing assumptions about mothers of malnourished children (e.g., "*they are unable to estimate the duration of symptoms*"). Caregivers viewed TB as dangerous but often positioned themselves as "*uninformed*" reflecting internalized social judgments, leaving TB management to HWs (e.g., "*We can't understand it, we're villagers*").
In contrast, in Guinea, HWs treating CLHIV described the impact of organizational barriers on communication with caregivers (e.g. lack of time). Caregivers of CLHIV saw themselves as "*health partners*," sharing a good understanding of the TB diagnostic process. They were comforted that TB can be effectively treated; however, the TB diagnosis often remained a family secret due to fear of stigmatization.
Conclusions: Results highlight that communication between HWs and caregivers was shaped by their experiences of pre-existing care pathways and sociocultural beliefs. Implementation of TDAs is an opportunity to support and improve child and family focused communication strategies in different contexts.

EP38-1066-20 Assessment of the social support available to TB-affected communities in Viet Nam

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Background: As low-income countries graduate to middle-income countries, they transition away from donor-financing and are pushed towards high-income health system models, where decentralization ensures alignment between budget allocation and regional needs. As Viet Nam faces this transition, this study conducted a comprehensive assessment of tuberculosis (TB) support programs across its 63 provinces to monitor the decentralisation process and inform policy-makers on local needs and challenges.
Design/Methods: In 2024, a cross-sectional survey was conducted across all provinces. The survey focused on the types of support packages offered, funding sources, and dedicated provincial-level TB-specific plans. A provincial-level scoring system was developed, informed by participatory workshops with TB survivors and healthcare providers. Provincial profiles from the survey were matched against the scoring system to map the provincial level of support offered to people with TB.
Results: Health insurance enrollment was the most common support package, reported in 76.2% of provinces, while livelihood support packages were the least common, reported in 9.5% of provinces. There were a total of 332 different support packages reported across the 63 provinces. Most support packages were funded by PASTB, the Global Fund, and national budgets, with only 4% funded by provincial budgets.

Conclusions: These findings highlight a high variability of support available for people with TB throughout the country, and show that access to social protection is highly fragmented, with several packages for the same kind of support being offered within provinces. These findings also indicated that funding for the support of people with TB is still not very decentralized and is still dependent on external aid. This work is essential for shaping global frameworks to ensure comprehensive support for TB patients, aligning with commitments made at the 2023 UN High-Level Meeting on TB. Addressing these challenges is critical for Viet Nam's health system transition and for meeting global TB care goals.

EP38-1067-20 Breaking barriers: Assessing community-led, rights-based, and gender-transformative TB responses in conflict-affected zones of Tigray, Ethiopia

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Background: Tuberculosis (TB) remains a pressing public health challenge, especially in conflict-affected regions like Tigray, Ethiopia, where health systems have collapsed, and service access is severely constrained. Community-led, rights-based, and gender-transformative (CRG) TB approaches offer a pathway to equitable and people-centered care.
This study assessed the implementation of CRG-TB programming in the war-affected Central and Northwest Zones of Tigray in 2024.
Design/Methods: A cross-sectional study design using mixed methods was employed. Quantitative data were collected from 425 respondents (56.2% female; mean age 43.4±15.0 years), including TB patients, survivors, families, healthcare providers, and community members. Qualitative data were gathered through 6 focus group discussions (56 participants), 24 key informant interviews (KIIs), and 12 health facility observations.
The study explored barriers related to availability, accessibility, acceptability, and quality (AAAQ) of TB services, alongside CRG dimensions.
Results: Around 42.5% of participants rated TB service availability as poor or very poor, while 46.1% and 52.6% reported poor accessibility and quality, respectively. Acceptability was rated positively by 84.7%. However, only 25.9% reported community engagement in TB programming. Just 11.3% had participated in TB rights advocacy, and 8.7% had opportunities to exercise their rights. Only 15.8% believed the TB program considered gender dynamics. Qualitative findings revealed deep-rooted barriers including stigma, lack of privacy, dismantled community platforms (HDA/WDA), gender-based discrimination, limited legal support, and healthcare worker capacity gaps. Stigma and discrimination were consistently cited across all respondent types as key deterrents to seeking or adhering to TB care.
Conclusions: The study highlights critical gaps in CRG-TB implementation in Tigray, particularly due to conflict-related service disruption, low community involvement, weak rights frameworks, and minimal gender integration. Recommendations include rebuilding TB infrastructure, strengthening legal protections, revitalizing community platforms, and embedding gender-sensitive and rights-based approaches into TB programming to improve outcomes in conflict-affected settings.

EP38-1068-20 Putting the pedal to the metal by integrating HIV screening services to other health services through community-led initiatives: Results from GFATM supported project in India

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Background and challenges to implementation: Complementing Govt. of India's effort to end AIDS by 2030 and eliminate TB, Plan India is implementing One Stop Center (OSC) project in 25 Indian states through community led Innovative strategy with Key and Bridge Population groups.
Intervention or response: Strategic approaches remained A) to ensure HIV testing by reaching out to new & uncovered Key & Bridge Population, B) to ensure viral suppression for all clients identified as HIV positive and ensuring prevention for all have been identified as negative.
Generative digital intelligence guided process deployed to ensure follow up, re-testing and re- linking of the client diagnosed.
Results/Impact: A total of 150K Transgender, PWID, Truckers and Migrants registered in OSC project. Around 85% (n=148,464) clients received HIV testing and around 1.5 thousand clients newly diagnosed as HIV positive; and successfully linked with treatment services. HIV Positivity remained 3.64% (n=8,879) among transgender, 5.70% (n=13,018) among the PWID and 0.41% (103,664) among the trucker and migrants receiving HIV testing. Most (98%) of the registered client received TB 4s screening. Around 66% of total registered client received STI screening services, Viral hepatitis screening was accessed by 21% of registered client. A bouquet of value-added services was provided i.e. 88% of the clients received general Health check-ups including Blood Pressure & Blood

Sugar etc., 83% of the clients received counselling on ART adherence, Counselling on IEC, prevention & risk reduction etc. Clients received awareness on legal aid, TG Shelter Homes, Drug De-Addiction and rehabilitation. More than 31% of the registered client received condom. Around 7% of the registered client reached with Social welfare and entitlement scheme services.

Conclusions: Integrating HIV and Tuberculosis screening with other health service packages has resulted in increased HIV/ TB screening and diagnosis. Provision of general health services with value-added services at OSC has attracted KPs to the centre otherwise remained hidden.

EP38-1069-20 Beyond the Pill: Person-centred support for drug-resistant TB treatment adherence in Delhi (Lessons from the Dream Delhi Project)

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Background and challenges to implementation: India accounts for 27% of global drug-resistant Tuberculosis (DR-TB) cases. Delhi has the highest prevalence of DR-TB in India. About one-third of DR-TB patients in Delhi were either not initiated on treatment or were lost to follow-up. In 2018, 18% of DR-TB patients in Delhi were lost to follow-up. Socioeconomic factors, including poverty, malnutrition, lack of funds for transport, lack of social support, and mental health issues, have been documented to impact treatment adherence of DR-TB patients. Currently, there is no mechanism for the early identification of high-risk patients who may not complete their treatment.

Intervention or response: We developed a screening tool to identify the needs of DR-TB patients for food support, transportation support, and mental health support and categorized patients into low risk and high risk for treatment non-adherence.

Nutritional support was provided using high calorie and protien rich food grains per month not only for patient but as a family ration packets . Transportation support for healthcare visits was provided through nutritional vendor as door step delivary mechanism for the malnurished and deblitated patients . Vocational training skill such as tailoring and computer skills were offered to eligible patients.

Results/Impact: From April 2022 to July 2023, the Dream Delhi Project enrolled 1,200 DR-TB patients from the following five urban areas of Delhi: Lok Nayak ,Malviya Nagar, Nehru Nagar, Patparganj, and Shadara. A total of 301 patients received nutritional support, 174 received transportation support, 42 received multiple counselling support, and 41 received vocational support. Lost to follow-up were 118 patients (9.8%), nearly half of the previously reported value of 18%.

Conclusions: Need assessment and patient-centred delivery of social support along with treatment can significantly reduce nonadherence to DR-TB treatment ; urgent need for mechanisms to identify patients who are at high risk due to social, economic, and mental health problems.

EP38-1070-20 Stakeholder perspectives on new TB vaccine introduction in Indonesia: Concerns and priorities

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Background: New TB vaccines are seen as key to global TB elimination efforts, but implementation challenges remain uncertain. As the country with the world‘s second-highest TB burden, Indonesia has participated in vaccine trials. Following a 2024 national workshop on new TB vaccine acceptance, this study further explored stakeholders‘ concerns about introducing the vaccines in Indonesia.

Design/Methods: A multi-stakeholder consultation was held, inviting 28 representatives from government agencies, TB and vaccine experts, and international partners (WHO, UNICEF). Data were collected in an in-person group meeting using an individual questionnaire featuring both multiple-choice and open-ended questions. Analysis employed a mixed-methods approach combining quantitative assessment with qualitative thematic analysis.

Results: Of 28 invitees, 23 participated the study and completed the questionnaire (9 government, 10 experts, 4 international partners), representing expertise in vaccine (7), TB (9), and policy development (7). Primary concerns centred on vaccine efficacy (19/23) and comparative effectiveness against other TB control interventions (18/23). Most participants (15/23) would reject vaccines with efficacy <50%, while seven required minimum 60-80% efficacy. Most (23/23) respondents supported vaccine introduction without requirement of complete local manufacturing capability, and all identified financ-

ing as the critical implementation challenge. Participants emphasized that financial barriers could be overcome through strengthened political commitment, including strategic advocacy to governing political parties.
The previous workshop suggested that the vaccine would be targeted to the general population due to high incidence, and this workshop highlighted additional targeting to high-risk populations: people living with HIV/AIDS (21/23), those with diabetes (18/23), and household contacts of TB patients (18/23); and specific populations: adolescents (16/23), adults (14/23) and healthcare workers (14/23).
Conclusions: TB vaccine introduction in Indonesia requires addressing concerns about efficacy and securing sustainable financing through advocacy for political commitment. Stakeholders recommend targeting both general and high-risk populations. These findings can guide evidence-based planning for future TB vaccine deployment in high-burden settings.

EP39 Engaging private sector to innovate finding TB

EP39-1071-20 Leveraging an intermediary organisation to enhance private sector TB detection in Lagos State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB), despite being curable, remains a leading cause of death globally and in Nigeria, which ranks among the top 10 high-TB-burden countries with an incidence of 219 per 100,000. Lagos State with a population estimated at 18 million persons, alone contributes approximately 11% of the national burden. More than 76% of TB cases remain undetected each year, largely due to stigma, knowledge gaps, and poor access to diagnosis and treatment—especially within the 52% of Nigerians who seek care from the private sector.
Traditional public-private mix (PPM) models, coordinated solely by government actors, have yielded limited success, prompting a shift towards utilizing intermediary organizations (IOs) for more effective engagement. An IO plays coordination, mobilisation, supervision, mentoring, sustainability and catalytic roles.

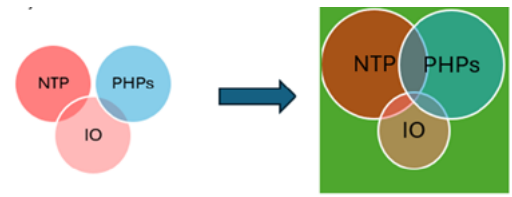

Figure 1: Illustrating the role of Intermediary Organisation creating an enabling environment between PHPs and the National TB Program (NTP)

Intervention or response: Project Description: Under the USAID-funded TB Local Organization Network (TB-LON 3), Loving Gaze, a Nigerian NGO, was engaged as an IO to enhance private sector participation in TB control in Lagos State.
Building on prior success under the USAID SHOPS Plus project, Loving Gaze deployed a tailored model to engage 1,757 private healthcare providers through training, mentorship, and supportive supervision. Key innovations included the use of a modified screening algorithm,

virtual TB networks, and logistical/incentive support for diagnostics, treatment, and TB preventive therapy—all aligned with national guidelines.
Results/Impact: The intervention led to the notification of 13,200 TB cases and 19,484 contact follow-ups by private providers by the end of the project. This significantly reduced the proportion of missing TB cases and improved access to TB services across formal and informal private care networks.
Conclusions: The IO model demonstrates strong potential to sustainably scale up private sector TB response. National programs should consider adopting this approach to strengthen provider networks, expand screening, and enhance equitable access to TB services—crucial for achieving the End TB Strategy goals.

EP39-1072-20 Finding TB through the intensified Integrating Screen-For-All (SFA) approach in routine primary care services to improve TB detection in Myanmar Medical Association private-public mix clinics

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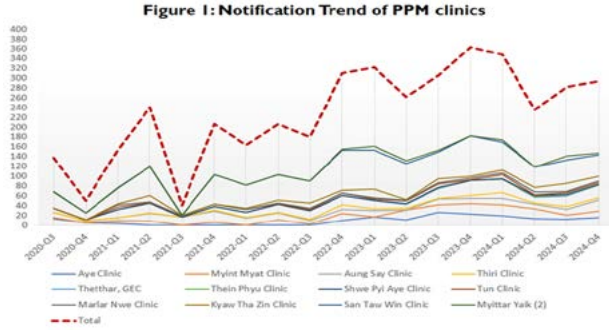
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health threat in Myanmar, where delays in diagnosis contribute to ongoing transmission and sub-optimal outcomes. In Private-Public Mix (PPM) clinics, TB case finding has traditionally relied on passive approaches, evaluating only presumptives who disclose TB symptoms. This strategy can often miss individuals with less obvious symptoms or those unaware of TB symptoms.
Intervention or response: Myanmar Medical Association (MMA) introduced an Intensified Case Finding (ICF) approach, Screen-for-All (SFA) in selected PPM clinics. This approach actively screened all clinic clients and their attendees for presumptive TB symptoms using a standardized SFA checklist, regardless of their complaints during visits. Symptomatic individuals were referred for chest X-ray (CXR) and/or sputum testing.
The approach was integrated into existing TB care workflows beginning in Q4 2022. A retrospective review of TB notification trends was conducted to compare data before and after implementation. Structured surveys assessed feasibility, acceptability, and implementation challenges among 12 clinic providers.
Results/Impact: The TB notification more than doubled from 70 PwTB per quarter before Q4 2022 to 160 PwTB in 2023 following the implementation of SFA approach and continued remaining steady (Figure1: Notification Trend of PPM Clinics). All providers agreed the approach integrates well within existing workflows; 92% found the register easy to use. While most clinics screened fewer than 50% of attendees daily, all respondents believed SFA led to earlier TB detection and reduced transmission. Key barriers included patient resistance (50%), limited consultation time (33%), and sputum transport issues (25%). Providers recommended sustaining the SFA approach, additional clinic staff training, and enhanced patient education.

Figure 1: Notification Trend of PPM clinics



Conclusions: The intensified symptom screening approach (SFA) enhanced TB detection in PPM clinics. Mutual engagement between clinic attendees and providers demonstrated SFA's feasibility and acceptability within the PPM context. These findings support scaling up ICF strategies to strengthen TB control efforts in similar high-burden settings.

EP39-1073-20 Making a case for poor-performing facilities in TB disease identification in the private sector: Avoiding throwing the baby out with the bathwater

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Background and challenges to implementation: Tuberculosis remains a significant public health concern, necessitating proactive detection strategies, particularly within the private sector. As a Sub-Recipient under the Global Fund CPPM GC-7 Grant, KNCV Nigeria has a goal of increasing private sector contributions to national TB disease notification towards achieving the END TB goal. Despite huge efforts in proactive case-finding, some private health facilities have low TB disease detection due to

fundamental gaps in their operations. These „poor-performing" facilities are typically perceived as „High Investment-Low Yield" locations and deprioritized or omitted from interventions due to need for resource optimization, thereby neglecting their contextual constraints and latent potential.

Intervention or response: A targeted performance improvement plan was implemented across 7 selected low-performing private facilities. This plan involved reorientation of healthcare providers on WHO TB symptom checklist, integrating digital screening tool (MATSAPP), strengthening referral linkages to diagnostics sites and ensuring continuous oversight by KNCV employed Adhoc staff. Additionally, Incentivized engagement was incorporated to enhance TB patient care and sustain involvement during treatment. Active monitoring of performance was instituted to assess facility TB presumptive identification, TB detection, and treatment enrollment during the period.

Results/Impact: Initial assessments revealed that poor-performing facilities often faced challenges such as low TB awareness, competing health priorities, staff attrition, and inadequate diagnostic capacities. Following the intervention, presumptive TB identification rose from 211 in Q2 2024 to 686 in Q4 2024. TB cases increased from 21 to 62 within the same period. Despite a lower conversion rate than high-performing facilities, these facilities showed a consistent increase in case notification thus validating the targeted support.

Conclusions: The performance improvement plan with strategic interventions has shown to significantly improve presumptive TB and positive TB detection in private sector health facilities, which were hitherto poor performing. Sustained engagement of all private health providers, regardless of initial performance, is critical to achieving TB elimination goals.

EP39-1074-20 STEPS toward excellence: Ensuring quality of TB care at Yashoda Super Speciality Kaushambi, a private hospital in Uttar Pradesh, India

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Background and challenges to implementation: There were concerns about the suboptimal quality of TB care from private sector including lack of systems for treatment adherence support and a high loss to follow-up rates. Yashoda Super Speciality Hospitals Kaushambi, a 500 bedded private tertiary care centre, was the first facility in Northern India to implement the STEPS (System for TB Elimination by Private Sector) to ensure standards of TB care to all the clients reaching them.

Intervention or response: STEPS center is established as a single window mechanism (Figure1) by the hospital management and works under a Medical Officer (STEPS Nodal Officer) assisted by a Physician Assistant (STEPS Lead).

The STEPS center works with all stakeholders like clinicians, clients, laboratory, pharmacy, nursing, and medical record departments in a hub and spoke model. The center supports clinicians and clients to ensure standards of TB care by ensuring all individuals with presumed TB are tested using a molecular test, supported for treatment adherence through counseling and weekly phone calls and their contacts are investigated. The center notifies all individuals with TB and reports their treatment outcomes. The entire process fosters customer loyalty through an 'after- sales care model'.

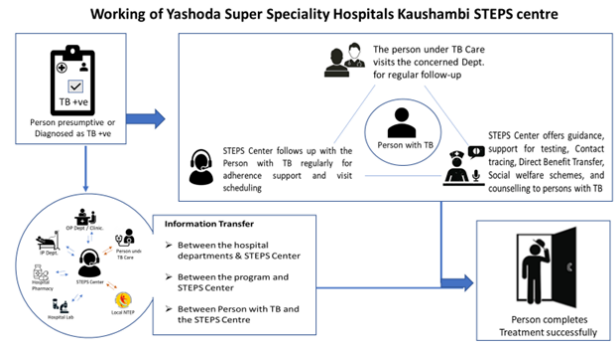

Figure 1. Working of Yashoda Super Speciality Hospitals Kaushambi STEPS centre.

Results/Impact: TB notification has doubled since initiation of STEPS centre (445 from March2024-Feb2025 compared to 226 from March2023-Feb2024), with documented improvements in the microbiological confirmation (40% vs 26%), lost to follow up rates (4% Vs 17%), rifampicin sensitivity testing (97% Vs 37%), HIV testing (100% Vs 72%) and reported treatment outcomes (84% Vs 37%). Total additional expense for implementing STEPS for the hospital per 100people with TB diagnosed in a year was 573 USD while additional business returns for the hospital was 1145 USD.
Conclusions: Models like STEPS where private hospitals assuming accountability to ensure standards of TB care to the clients reaching them is possible and it improves the standards of TB care.

EP39-1075-20 Private public mix (PPM) as a key driver of finding TB in Ogun State (2018-2024)

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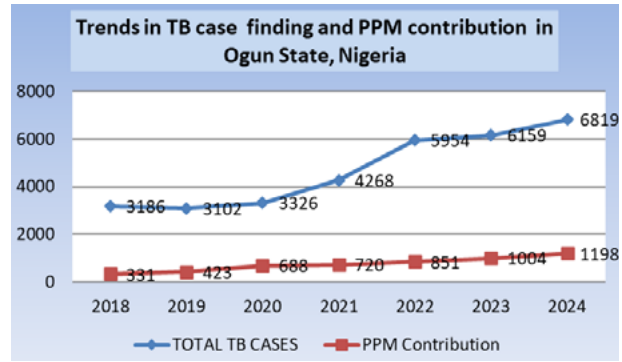
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in Nigeria, which ranks sixth globally and first in Africa among high TB-burden countries, with an estimated incidence rate of 219 per 100,000 population (WHO, 2021). Despite improvements in TB treatment coverage (70%), Nigeria is among the 14 countries with the highest burden of TB, TB/HIV co-infection, and multidrug-resistant TB (MDR-TB).
This study evaluates the impact of engaging multiple tiers of the Private Public Mix (PPM) approach in reducing the TB case detection gap in this high-burden context.
Intervention or response: A multi-tiered PPM model was implemented in collaboration with partners beginning in 2018.

- **Scheme 1** involved Private Proprietary Medicine Vendors (PPMVs), who identified and referred individuals with presumptive drug-sensitive (DS-TB) and drug-resistant TB (DR-TB).
- **Scheme 2** included stand-alone laboratories and non-NTP facilities that screened, diagnosed, and referred individuals with TB to DOTS centers.
- **Schemes 3 and 4** offered diagnostic services, treatment, and ongoing care.
- Linkage Coordinators ensured that every individual identified with presumptive or confirmed TB was successfully linked to care. Data from all schemes were analyzed to assess their contribution to TB case detection over time.

Results/Impact: Between 2018 and 2024, TB case notifications increased from 3,186 to 6,819. PPM contributions rose from 331 cases (10%) in 2018 to 1,198 cases (18%) in 2024. A notable surge occurred in 2020, with 688 cases detected, underscoring the critical role of private providers during the COVID-19 pandemic.



Conclusions: Strengthening collaboration between public health systems and private healthcare providers has significantly improved TB case detection and treatment access in Ogun State.
This study emphasizes the value of inclusive, multi-tiered partnerships in closing TB detection gaps and supports broader adoption of PPM models in national TB control strategies.

EP39-1076-20 Stand-alone lab intervention: A key driver to scaling up TB diagnosis in the Public Private Mix (PPM) model: A KNCV Nigeria experience

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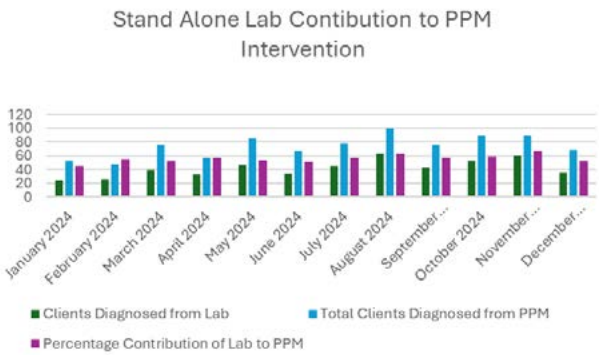
Background and challenges to implementation: Tuberculosis (TB) remains a major public health concern in Nigeria, with low case detection, especially in the private sector. To bridge this gap, private healthcare providers were introduced to strengthen TB control efforts. Engaging Standalone laboratories with high client volumes as a TB screening center became necessary to serve as a strategic solution towards improving TB case finding.
Intervention or response: To strengthen TB case detection through private sector engagement, a hub-and-spoke model was implemented, linking standalone laboratories

(spokes) with private hospitals (hubs) participating in the PPM intervention. Selected laboratories were engaged as collaborators and their staff were trained on TB screening, identification of presumptive, and on efficient referral system. Initial screening was conducted at the labs, and individuals presumed of having TB were referred to designated hub hospitals for confirmatory diagnosis using GeneXpert and other appropriate diagnostic tools. Once diagnosed, TB patients at the hub hospitals were promptly linked to treatment services through the support of TBLS and DOTS providers.

Results/Impact: From January 2024 to December 2024, a total of 30,875 clients were screened from the standalone labs across Plateau state, 108 TB cases with average of 9 per month were diagnosed and notified, thereby contributing significant 12% to the overall PPM case notification in the state as depicted below.



Conclusions: Scaling up this model in the future to other settings and strengthening referral linkages will expand TB control. Policymakers and implementers of TB programs must consider independent labs as key partners in the fight against TB, ensuring continued engagement, capacity building, and mainstreaming in national TB strategies.

EP39-1077-20 Enhancing finding TB and strengthening the cascade of care: A public private mix approach in Ghana

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Background and challenges to implementation: In Ghana, the private sector accounts for approximately 40% of healthcare services but remains under-engaged in tuberculosis (TB) screening and management. Over-reliance on public facilities for TB detection has contributed to persistent shortfalls in annual TB notification targets, exacerbating gaps in diagnosis and treatment follow-up. Additionally, limited capacity and insufficient infrastructure within private healthcare settings hinder their potential to effectively manage TB care, presenting a barrier to national TB elimination goals.

Intervention or response: To address these challenges, Aurum Institute Ghana, under Global Fund Grant Cycle 7, collaborated with Regional and District Health Management Teams to enhance private-sector engagement in TB case detection across Ashanti, Greater Accra, Western, and Northern regions.

The intervention included 90 high-volume private health facilities and 80 private pharmacies or over-the-counter medicine shops (OTCMs) across 27 districts. Twenty GeneXpert machines were strategically installed using a hub-and-spoke model for efficient sputum transport.

A total of 375 healthcare providers were trained to systematically screen outpatients using TB symptom-based registers and provided comprehensive, patient-centred care aligned with national standards.

Additionally, 37 TB Champions were trained to support with screening, sputum transport, linkage to care, contact tracing, and preventive therapy. Chest X-rays were provided at designated free sites for sputum-scarce clients, and diagnosed cases were promptly initiated or referred for treatment.

Results/Impact: From January to December 2024, 197,011 clients were screened, identifying 22,786 presumptive TB cases. Of these, 11,945 (52.4%) underwent testing, resulting in 528 bacteriologically confirmed, 68 clinically diagnosed, and 6 extrapulmonary cases. Of the 602 total cases notified, 589 (98%) were initiated on treatment successfully, representing 3% of Ghana's national TB notification in 2024.

Conclusions: Strengthening private-sector engagement significantly enhances TB case detection and continuity of care, demonstrating the need for sustained investment and strategic alignment with private stakeholders.

EP39-1078-20 Private provider-initiated facility based intensified case finding for TB: Experiences from a private hospital in New Delhi, India

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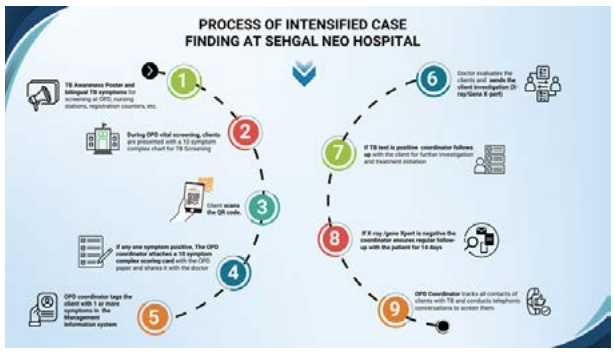
Background and challenges to implementation: New Delhi is the state in India with a high prevalence of TB (>700/100,000). More than half of the people with TB symptoms seek care from private providers. A significant delay for diagnosis of TB has been documented in the state, especially among those reaching the private sector.
Intervention or response: An intensified case finding (ICF) has been launched by Sehgal Neo Hospital, a 100 bedded private hospital in New Delhi, India, as a part of their social commitment, where they pictorially displayed 10 common symptoms of TB in key areas of the hospital such as the OPD, emergency room, dialysis area, X-ray room, wards, and pharmacy. A QR code was displayed at each location, allowing clients reaching the hospital to scan the code and complete the TB screening questionnaire. A hospital staff, nominated by the hospital administration, followed up with the individuals found positive for any symptoms on a real time basis and guided them to the doctor for further evaluation and care.



Results/Impact: A total of 15,731 individuals were screened for tuberculosis during January 24-March 24, 2025. Of these, 835 were identified as individuals with presumed TB and 688 underwent further testing and 35 were diagnosed to have TB and all were initiated on treatment. Average number of people tested for TB per month increased by 2.1 times and average number of TB diagnosed per month increased by 2.5 times during the intervention period as compared to prior to the intervention.

Conclusions: The QR code based screening process streamlines TB screening into a contactless and fast screening reducing the delays in diagnosis and treatment. Minimal resource requirement & simplicity in this model advocates for its replication across all hospitals. It also demonstrates the accountability of private health care sector in Ending TB.

EP39-1079-20 Innovative approach to finding TB in the private sector: Results from stand-alone (SALs) private laboratories in Benue State

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Nigeria, despite effective prevention and treatment options. Over 60% of individuals initiate care in the private sector, yet TB case-finding efforts have focused mainly on public facilities, creating detection gaps. Stand-Alone Laboratories (SALs), widely used for diagnostics, are an underutilized resource for TB detection. Leveraging these labs through structured strategies is essential to improving early diagnosis and ensuring timely linkage to care.
Intervention or response: A cross-sectional descriptive study evaluated the effectiveness of the SAL intervention to improve TB case detection and treatment linkage in Benue State. The intervention involved 30 SALs from January 2023 to December 2024.
Trained lab personnel screened all clients and their accompanying partners for TB symptoms using a standardized checklist. Presumptive cases were referred to diagnostic centers under a hub-and-spoke model for bacteriological confirmation using molecular tools—GeneXpert, TB LAMP, or Truenat—in line with NTBLCP guidelines. Confirmed tuberculosis (TB) cases were immediately enrolled for treatment at Directly Observed Treatment (DOT) facilities. Corresponding case data were duly recorded in the National TB Registers and reported via the District Health Information System (DHIS2) platform following national reporting guidelines.
Results/Impact: Over two years, 105,928 individuals were screened across the 30 SALs. Of these, 5,696 (5%) were presumptive TB cases. All were evaluated, with 412 (7.2%) confirmed positive. All diagnosed patients (100%) were successfully initiated on treatment.
TB case detection increased by 64% between 2023 and 2024, while evaluated presumptive cases rose by 40%, underscoring the intervention's role in improving early identification and care linkage.

Year	Screened	Presumptive	Evaluated	Diagnosed	Treatment
2023	50819	2374	2374	156	156
2024	55109	3322	3322	256	256
Total	105928	5696	5696	412	412

Table.TB cases identified under stand-alone laboratories (SALs) in two years.

Conclusions: Private sector engagement through SALs is essential to closing TB detection gaps. Scaling and sustaining this model can significantly strengthen national TB control efforts.

EP39-1080-20 Impact of a large-scale private sector intervention on TB notifications and treatment outcomes in India: A difference in difference analysis

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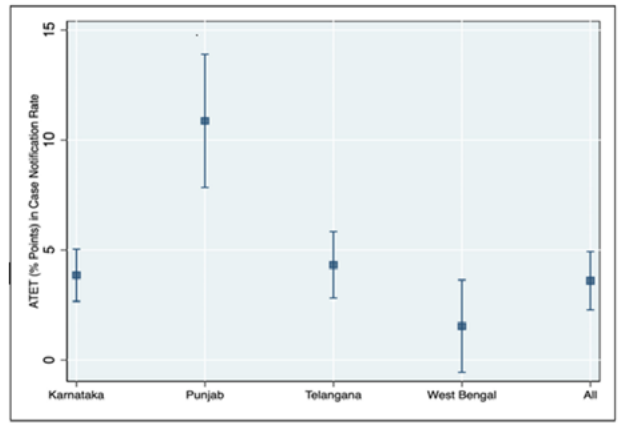
Background and challenges to implementation: Over half of Tuberculosis (TB) patients in India initially seek care in private-sector, necessitating their engagement to achieve End TB goals. However, large-scale, sustainable interventions targeting the private-sector remain limited.
Intervention or response: To engage the private-sector, "Joint Effort for Elimination of Tuberculosis" (JEET) project was implemented by FIND in collaboration with National TB Elimination Programme (NTEP) and supported by the Global Fund between 2018–2021.
The Patient Provider Support Agency (PPSA) model under the project was deployed in 21 districts across five states in India (Andhra Pradesh, Telangana, Karnataka, Punjab, and West Bengal) to facilitate TB diagnosis and treatment adherence through a hub-and-spoke model.
Data from the Government's *Ni-kshay* portal were analyzed for 2017 (baseline) to 2021 to assess trends/rates in private-sector TB notifications and treatment outcomes. Difference-in-Difference analysis was performed to compare notifications from implementation and non-implementation districts in the same states.
Results/Impact: Private-sector case notification rates increased from 34 per 100,000 population in 2017 to 102 in 2021. Treatment success rates improved from 81% in 2017 to 92% in 2021. However, disruptions due to COVID-19 led to temporary decline in notifications during 2020 (from 86 per 100,000 population in 2019 to 72 in 2020), followed by recovery in 2021. The analyses (figure-1) showed significant Average Treatment Effect on the Treated (ATET) of 3.59% points (95%CI: 2.34–4.93) across implementation districts compared to non-implementation districts. Punjab demonstrated the highest ATET at 10.86% points (95%CI: 7.98–14.03). Results were held up under the parallel trend assumptions.

Figure 1: Average Treatment Effect on the Treated for the project implementation districts as Treatment Group, 2017-2021 (Andhra Pradesh was excluded from the analysis as all districts were covered under the JEET project)



Footnote: Average Treatment Effect on the Treated (ATET) estimates the causal effect of an intervention specifically on those who received the treatment. Under the JEET project, it quantifies the difference in outcomes between districts implementing the PPSA model (treatment) and non-implementing districts, isolating the intervention's impact on the targeted population.

Conclusions: Project demonstrated significant improvements in TB care through private-sector engagement. The robust design and measurable impact across districts in India could make this a replicable model for improving TB care in other high-burden countries. To sustain the gains, PPSA model is being scaled-up in 438 districts through domestic resources supporting India's progress toward TB elimination.

EP40 Burning planet, broken systems: Addressing TB at the crossroads of climate inequality

EP40-1081-20 Impact of climate change on TB in East Africa: Development and validation of a conceptual framework

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Background: Several of the pathways proposed in the recent (2025) WHO research framework linking Climate Change (CC) and tuberculosis (TB) need to be underpinned by real-world TB data to provide recommendations to policymakers for effective adaptation of the health system response during climate shocks.
We aim to obtain robust evidence on how future climate shocks/gradual CC can compromise progress to TB elimination in two highly climate-sensitive regions (Karamoja-Uganda and Turkana- Kenya), through an interdisciplinary approach.
Design/Methods: The CLIMATE consortium, started early 2024, brings together public health, climate, nutrition, demography and modelling experts together with the National TB and Leprosy Programs of Uganda and Kenya. A conceptual framework was prepared, based on narrative literature reviews and expert consultations. The first ecological epidemiologic study spanning 18 years was performed in Karamoja, the second is in preparation in Turkana.
The findings will be used to correlate, at district level, climate data to historical food insecurity/undernutrition and TB notification and outcome data, to enable modelling of TB epidemic projections according to different future climatic scenarios.
Results: The conceptual framework (see Figure) was developed and identified potential interactions between CC and TB through
1. Water and food insecurity/undernutrition,
2. Access to/quality of health care, and;
3. Mobility/migration.
At the Union conference, data from the ecological studies will be available to validate our conceptual framework.

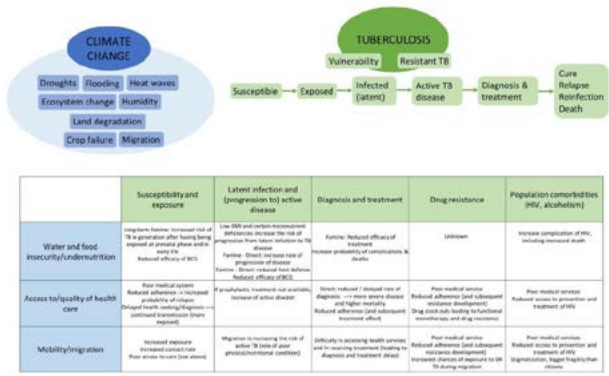

Figure. Research conceptual framework of the impact of climate change on tuberculosis elimination.

Additional findings available will include ethnographic surveys with TB-affected communities on mobility to better understand and document TB control service resilience through their experience in terms of diagnostic and treatment pathways; and semi-structured interviews with health care workers and policy makers, to assess barriers and opportunities for adaptation of strategies for climate resilient TB services in this region.
Conclusions: The CLIMATE consortium projects will contribute to better understanding, anticipating and preparing the response to the impact of CC on TB in Uganda and Kenya.

EP40-1082-20 TB integrated screening at the coalface of climate-change: Lessons about what works from a qualitative study with Pacific-island leaders and donors

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Background: In Pacific-island nations, climate pressure, low national income, surging non-communicable diseases (NCDs) and the *status quo* of endemic tuberculosis undermine the political imperative to adopt strategies driving elimination. Community-wide screening for tuberculosis could reduce tuberculosis incidence, yet country-level uptake of this WHO-endorsed strategy in the Pacific is limited.
It is widely assumed that this poor uptake results from deficient political will and perceptions of excessive costs or scepticism towards feasibility. We interviewed senior

country health leaders and regional donors to ascertain whether these assumptions align with the perspectives of those making decisions in the Pacific.

Design/Methods: Adopting an iterative approach, we conducted qualitative research using semi-structured key-informant interviews with national leaders from 6 high-incidence Pacific small island nations (tuberculosis incidence >50/100,000) and with 5 health donor and technical assistance organisations to explore perceptions towards community-wide tuberculosis screening in the Pacific.

Results: Interviews reveal that a narrow disease focus does not reflect the holistic way tuberculosis is viewed by either funders or national leaders in the Pacific. Participants identified NCDs and climate change (and its impact on mental health) as key considerations that add dimension to the challenge of ongoing tuberculosis transmission. Countries unanimously reported that integrated population-wide activities to prevent tuberculosis, NCDs and improve mental health were essential to attract and retain political buy-in, meet community felt needs, minimise stigma and–thereby– improve tuberculosis program uptake and effectiveness in the Pacific. However, successful integration required Ministry of Health and inter-donor cooperation, which were constrained by rigid funding structures and healthcare-worker attrition.

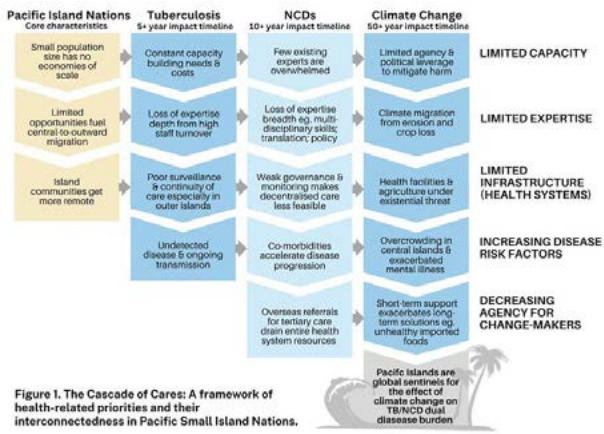

Figure 1. The Cascade of Cares: A framework of health-related priorities and their interconnectedness in Pacific Small Island Nations.

Conclusions: In the Pacific, needful improvements in tuberculosis screening do not result from a lack of political will, but rather highly constrained political choices in attending to multiple competing health priorities. Integrated, multi-disease screening may reduce competition between priorities and improve screening uptake if structural barriers can be overcome.

EP40-1083-20 Environmental impact assessments in TB healthcare settings in Nigeria: The gap between identification and action

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Background: Healthcare contributes to global environmental impacts, accounting for approximately 1% to 5% of total global impacts depending on the indicator, and exceeding 5% in some countries. Environmental Impact Assessment (EIA) tools are used to evaluate the potential environmental impacts of implementing and carrying out tuberculosis (TB)-related projects and routine activities. The tools identify potential positive and negative environmental outcomes and inform measures to minimize harm.

Design/Methods: Between 2022 and 2024, we conducted structured EIAs to evaluate environmental compliance in 1,847 TB health facilities across 14 states in Nigeria. The assessments focused on waste disposal, waste minimization practices, infection control, and carbon footprint reduction. Methods included direct observation of activities and work processes during site visits, and interviews with healthcare workers.

Results: About 85% of facility staff demonstrated general awareness and basic knowledge of biosafety and infection control protocols, and there was good compliance with personal protective equipment use. Critical gaps were identified, such as the absence of a designated area for sputum collection, poor waste disposal mechanisms, and a lack of structured training for staff on biosafety and infection control. Some questions of the assessment tool were not applicable to all facility levels, and the most significant gap was the lack of a clear follow-up mechanism to address the issues identified.

Conclusions: As the climate crisis intensifies, EIAs are increasingly mandated by funding agencies to ensure environmental responsibility in project design and implementation. Our study shows the usefulness of EIAs in identifying good practices and gaps in managing environmental impact of TB health facilities. However, lack of dedicated funding and a clear strategy for addressing the identified gaps limits their use. Future projects should incorporate standardized assessments per facility level and actionable mitigation strategies to ensure environmental monitoring and management plans are linked to budget allocations and follow-up mechanisms.

EP40-1084-20 Early results from a scoping review examining the intersection of TB and climate change through critical social science and One Health perspectives

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Background: Tuberculosis (TB) disproportionately affects marginalized populations. Climate change is increasingly recognized as a determinant of TB transmission and outcomes, yet social, ecological, and structural factors linking the two remain underexplored.
Design/Methods: We conducted a scoping review using a critical social science lens and the One Health framework to examine literature on TB and climate change.
As a secondary objective, we also assessed whether any marginalized or underrepresented communities (including Indigenous communities) were included.
We searched the following databases on November 21, 2024: Ovid MEDLINE; Ovid Embase; Cochrane Database of Systematic Reviews; Cochrane Central Register of Controlled Trials; Ovid Emcare Nursing; and Scopus.
We screened 3,111 peer-reviewed abstracts, and identified studies addressing TB in relation to environmental determinants such as air pollution, temperature variations, and food insecurity. Full text screening and additional data extraction is in process.
Results: Among 335 abstracts reviewed, key themes included air pollution (n=110), climate variability (n=308), and occupational exposures (n=23) as TB risk factors. Most studies focused on low- and middle-income countries, particularly China (n =90), India (n =16), and sub-Saharan Africa (n = 18).
Focus on populations considered to be at greater risks for both TB and climate change, including Indigenous populations (n=29) and islander communities (n=2) or populations displaced due to extreme weather events or climate-related hazards (n=10), was limited.
Emerging findings suggest that climate change exacerbates TB risk through structural vulnerabilities, particularly food insecurity and migration. Equity-focused approaches, such as social determinants or One Health were seldom applied.
Conclusions: Although equity-oriented frameworks are increasingly used in climate change research, they are largely absent in TB-focused studies. Given shared social determinants, future research could prioritize structural drivers, community resilience, and inclusive policies. Addressing TB in a changing climate requires strategies that bridge social, environmental, and biomedical perspectives, and that centres the voices and needs of affected communities.

EP40-1085-20 Air pollution and its toll: Unmasking the impact on TB in FCT, Kogi, and Nasarawa states

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Background: Tuberculosis (TB) remains a significant public health threat in Nigeria, exacerbated by emerging environmental risks. While traditional factors like HIV co-infection and malnutrition are well-documented, rising evidence suggests that air pollution particularly fine particulate matter (PM2.5), industrial emissions, and indoor smoke play a critical role in TB transmission and treatment outcomes. While studies in high-pollution regions such as India and China have demonstrated strong links between air pollution and TB burden, limited data exist for Nigeria.
This study assessed the association between environmental pollution and TB incidence and treatment outcomes in FCT, Kogi, and Nasarawa States, focusing on urban pollution hotspots.
Design/Methods: A retrospective analysis of 3,500 TB case notifications and treatment outcomes from 2022 to 2024 was conducted. Pollution data, including air quality indices (AQI) and PM2.5 levels, were sourced from the National Environmental Monitoring Agency (NEMA). Statistical correlations were analyzed using Pearson correlation and multiple linear regression models to determine the impact of pollution on TB incidence and treatment success. Data triangulation from hospital records, environmental reports, and demographic profiles validated the findings.
Results: TB incidence was 47% higher in high-pollution areas compared to cleaner zones ($p < 0.05$). Treatment success rates were significantly lower in polluted areas (62% vs. 80%, $p < 0.01$), likely due to pollution-induced respiratory stress, delayed healthcare-seeking, and increased exposure to secondary infections. Prolonged exposure to indoor biomass smoke and industrial emissions were identified as key factors affecting TB treatment outcomes.

Conclusions: Environmental pollution significantly influences TB incidence and treatment outcomes in FCT, Kogi, and Nasarawa States. To strengthen TB control, government agencies should integrate air quality monitoring into TB surveillance programs, promote cleaner cooking fuels, and enforce stricter emission regulations. Further research is needed to uncover causal pathways and develop targeted public health interventions.

EP40-1086-20 Is TB prevalence higher in cities or rural areas? A systematic review and meta-analysis of prevalence surveys

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Background: The world is rapidly urbanising, but how this affects TB epidemiology remains poorly understood. We investigated differences in the prevalence of pulmonary TB between urban and rural settings, and how these differences vary across World Health Organization (WHO) regions.
Design/Methods: We conducted a systematic review and meta-analysis of nationally representative and subnational TB prevalence studies published from 1993 through 2024 that reported urban-rural-stratified estimates of TB prevalence. Bayesian multilevel meta-regression was used to estimate the urban-to-rural prevalence ratio of bacteriologically confirmed pulmonary TB and its determinants.
Results: We screened 5,650 studies, of which 201 progressed to full-text review. Ultimately, 46 studies from four WHO regions (26 countries; 1,938,498 participants [39% urban, 61% rural]) reporting urban-rural stratified TB prevalence estimates were included in the final analysis.
Meta-regression estimated an 8% higher prevalence of bacteriologically confirmed TB in urban compared to rural areas (prevalence ratio [PR]: 1.08; 95% credible interval [CrI]: 0.67–1.56), although estimates varied across WHO regions. The African Region (PR: 1.24; 95% CrI: 0.96–1.60) showed higher TB prevalence in urban than rural areas. The South-East Asia Region (PR: 1.08; 95% CrI: 0.79–1.43) and the Eastern Mediterranean Region (PR: 1.08; 95% CrI: 0.67–1.63) showed broadly similar prevalence in urban and rural settings. In contrast, estimated urban TB prevalence was lower in the Western Pacific Region (PR: 0.92; 95% CrI: 0.59–1.30).

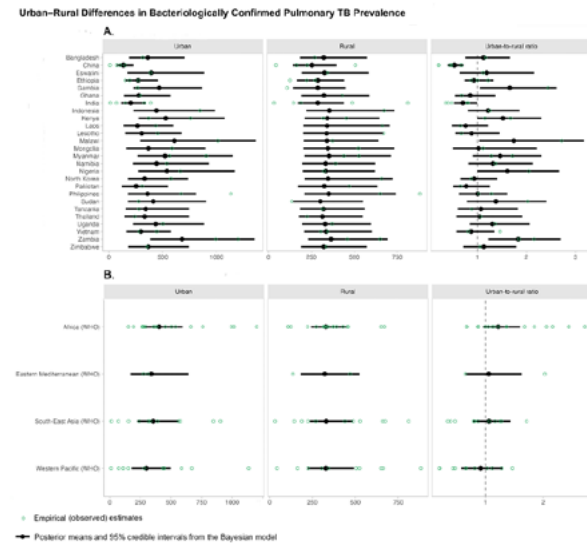

Figure 1. Urban–rural differences in bacteriologically confirmed pulmonary TB prevalence across countries and WHO regions (prevalence reported per 100,000 population).
Panel A: Country-level estimates; Panel B: WHO region-level estimates.

Conclusions: These findings highlight regional differences in TB prevalence between urban and rural areas, emphasising the need to understand local transmission dynamics. As urbanisation accelerates, its impact on TB prevalence should be examined more closely to inform effective public health planning.

EP40-1087-20 Outdoor air pollutants impair host immunity via TNF-α and IL-8 suppression, elevating pulmonary TB risk: A two-stage study

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Background: Previous studies have linked outdoor air pollution to an increased risk of pulmonary tuberculosis (PTB), yet the underlying biological mechanisms remain unclear. This study aimed to explore whether air pollutants alter PTB immunity-related cytokines, thereby influencing PTB susceptibility.
Design/Methods: A two-stage study was conducted. In Stage 1, plasma cytokine concentrations (TNF-α, IFN-γ, IL-2, IL-4, IL-8, IL-10, IL-12, IL-17A, IL-23) were com-

pared between 125 newly diagnosed PTB cases and 518 healthy individuals using generalized additive models (GAM) adjusted for demographics, lifestyle factors, and environmental variables (air pollutants and meteorological data at lag 0–14 days).
In Stage 2, the effects of air pollutants (SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO) on PTB immunity-related cytokines were evaluated in healthy individuals using GAM with adjustments for covariates.
Results: TNF-α and IL-8 were significantly elevated, while IL-17A was reduced in PTB cases compared to healthy controls. Among healthy individuals, SO_2 exposure was negatively associated with TNF-α (−86.12% decrease per 10-μg/m³ increase, 95% CI: −96.26, −48.55). PM_{10}, $PM_{2.5}$ and CO were negatively correlated with IL-8 (−22.70%, −32.16%, and −99.00% decreases, respectively).

Table. Percentage changes in pulmonary tuberculosis immunity-related cytokine concentrations and their 95% confidence intervals for each 10-μg/m³ (1-mg/m³ for CO) increase in ambient air pollutant concentrations at lag 0-14 days*.

Air pollutant	TNF-α	IL-8	IL-17A
SO_2	−86.12 (−96.26, −48.55)	−73.41 (−99.58, 1587.22)	−55.10 (−93.61, 215.47)
NO_2	−8.30 (−22.90, 9.07)	−30.11 (−61.32, 26.27)	−15.21 (−34.71, 10.11)
PM_{10}	−5.74 (−12.44, 1.47)	−22.70 (−37.27, −4.75)	−2.88 (−13.17, 8.62)
$PM_{2.5}$	−7.12 (−16.30, 3.07)	−32.16 (−49.27, −9.28)	−5.06 (−19.00, 11.26)
CO	24.16 (−70.83, 428.43)	−99.00 (−99.99, −27.38)	−31.44 (−92.80, 552.75)

*: Adjusted for sex, age, body mass index, smoking status, and average temperature, average wind speed, and average relative humidity at lag 0-14 days.

Conclusions: Outdoor air pollutants may reduce TNF-α and IL-8 expression, weakening host defense against Mycobacterium tuberculosis infection and increasing PTB risk. These findings highlight potential immunological pathways linking air pollution to PTB pathogenesis.

EP40-1088-20 Social-behavioural determinants shaping TB service uptake among household contacts of people with TB in the Eastern Cape, South Africa

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Background: Household contact investigations (HCI) can "find TB" and mitigate notification gaps. However, outcomes remain suboptimal in South Africa. MISSED OUTCOMES is a mixed methods study underway in a peri-urban and rural region of the Eastern Cape exploring the impacts of HCIs. We explored decision-making regarding TB testing among household contacts (HHCs).

Design/Methods: Between July 2024 and March 2025, HHCs screened at home and referred regardless of symptoms were purposively recruited for interviews focused on household TB, social context, family dynamics, risk perceptions, and care-seeking practices. We conducted thematic analysis using constant comparison, team discussions, and memos, with coding focusing on TB testing decisions.
Results: Participants included 30 consenting HHCs (60% women, 30% heads of household; relation to person on treatment, mean household size N=5); 40% presented for testing. Participants held diverse understandings about HCI visits.
While many recognized the need for TB screening, others believed visits were for general health, index follow-up, or were unaware of the household's status. HHCs were accepting of the person on treatment, particularly due to perceived adherence.
Both presenters and non-presenters experienced respiratory symptoms and fever, but TB testing decisions varied. Presenters had multiple health concerns, including hypertension, and felt encouraged by referral. They also showed greater trust in medical care.
Non-presenters reported conflicting commitments (e.g., employment, childcare) and noted that being on treatment reduced household transmission concerns. Some felt at low risk, especially after previous TB testing, treatment experiences, or perceived curability, and reported they would seek care only if symptoms worsened/ resembled TB disease.

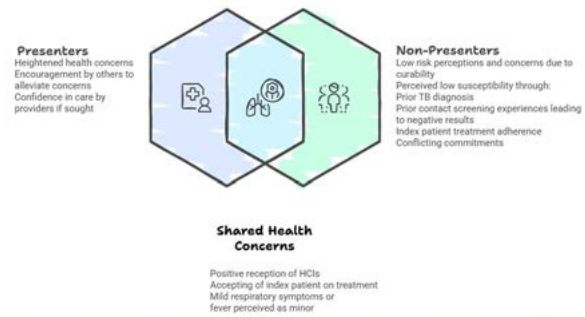

Figure 1. Household Contact TB Testing Decisions Based on Referrals: Similarities and Divergences Through the Lens of HCIs

Conclusions: Familiarity and trust in healthcare may enable HHCs to access timely TB screening and testing services. However, previous exposure or familiarity with TB care may counterintuitively hinder uptake.
Point-of-care testing, universal testing of all HHCs, and counselling on TB reinfection, risk, prevention, and recovery may enhance HCI outcomes.

EP40-1089-20 Social inequities in TB treatment uptake: Results from a qualitative intersectional gender research study in Eastern Cape province, South Africa

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Background: Tuberculosis (TB) persists as a major global health challenge. Tuberculosis largely affects marginalized and vulnerable populations, necessitating an equity-centric response. We used an intersectional gender lens to understand TB treatment non-uptake in a high-TB-burden setting.
Design/Methods: This qualitative study, carried out in South Africa within a multi-country consortium on gender and intersectionality in infectious diseases, combined focus group discussions with community members (age- and gender identity-stratified), in-depth interviews with persons with TB (PwTB) who had not initiated treatment (age- and gender identity-varied); and key informant interviews with health workers and managers. Data were collected during November 2022 - April 2023 and analyzed using modified grounded theory.
Results: Findings reiterate how the *apartheid* policy's systematic social, economic and cultural exclusion and separation of people by race groups, left a legacy of steep inequalities, and communities living under difficult conditions, with poor amenities and social connectedness, high unemployment, and low unstable incomes. Intersections of gender identities with age, race, locality, household circumstances, social change, and historical factors, among others, have shaped livelihoods, gender roles, and activity patterns, in turn, affecting disease exposure and information and healthcare access for different ethnicities, gender identities, and age groups.
Access to campaign information also emerged as gendered. For instance, unlike women, men were reportedly indifferent to information, especially when feeling they did not have disease. The overbearing precarity also implied campaign recommendations were inactionable, which damaged men's sense of manhood.
Additionally, men reported feeling emasculated when shepherded during information outreach activities.
Conclusions: Interventions to end TB need to pay attention to structural vulnerabilities. Campaigns and healthcare also need to utilize delivery modes tailored to different groups' needs.
In addition, it is important to address anxieties and mental struggles of PwTB. All this requires centring voices of communities and affected persons when designing, implementing, and evaluating interventions.

EP40-1090-20 Structural violence, poverty, and TB/HIV in Cross River State, South-South Nigeria: A social science perspective on health inequities

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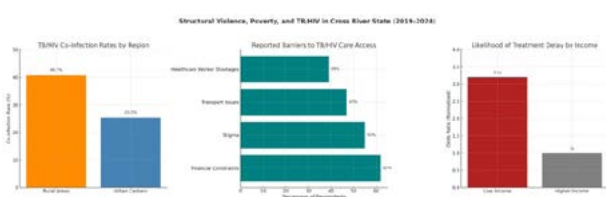
Background and challenges to implementation: Tuberculosis (TB) and HIV/AIDS remain significant public health challenges in Nigeria, with a disproportionate impact on impoverished and marginalized communities. Cross River State, located in South-South Nigeria, experiences a high burden of TB/HIV co-infection, worsened by structural violence, poverty, and systemic healthcare inequities.
Structural violence—manifested through inadequate healthcare infrastructure, socioeconomic deprivation, and policy failures—creates barriers to diagnosis, treatment, and care thereby increasing TB and HIV-related morbidity and mortality.
Objective: This study examines the intersection of structural violence, poverty, and TB/HIV co-infection in Cross River State, highlighting the socio-economic and systemic barriers to effective disease management.
Intervention or response: A mixed-methods study was conducted from 2019 to 2024:

- **Quantitative:** Analysis of TB/HIV prevalence and socioeconomic data.
- **Qualitative:** In-depth interviews with 150 patients and 30 healthcare workers across Cross South and North regions.

Key variables included income, access to care, treatment adherence, and systemic health limitations.
Results/Impact:



TB/HIV co-infection rate in Cross River State was found to be 32.5% among TB patients, significantly higher in impoverished rural areas (40.7%) compared to urban centers (25.3%). Key barriers to care included financial constraints (62%), transportation difficulties (47%), stigma (55%), and healthcare worker shortages (39%). Patients in low-income brackets had a 3.2 times higher likelihood ($p < 0.01$) of experiencing treatment delays compared to those with better financial stability.

Additionally, 73% of surveyed healthcare workers reported inadequate resources andpoor healthcare infrastructure is as major obstacle to TB/HIV management.

Conclusions: Structural violence and poverty significantly contribute to TB/HIV disparities in Cross River State, South-South Nigeria.

Addressing these health inequities requires targeted policies, increased healthcare funding, expanded social protection programs, and community-based interventions to improve access to diagnosis, treatment, and care.

Strengthening TB/HIV response strategies in impoverished communities is crucial to achieving equitable healthcare and reducing disease burden.

EP41 What do you need? Innovation to realise the delivery of person-centred care

EP41-1091-20 Improved treatment success rate among drug-susceptible people with TB through pre-treatment and routine counselling addressing stigmatisation in Delta State, Nigeria

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Background and challenges to implementation: The WHO End TB Strategy targets major reductions in TB burden by 2035, but poor treatment outcomes persist, especially in high-burden countries like Nigeria. In Delta State, stigmatization leads to treatment default and loss to follow-up. Internal assessments linked non-adherence to fear of discrimination, denial, and inadequate psychosocial support.

These challenges were particularly evident among patients in private sector facilities under the Public-Private Mix (PPM) approach, contributing significantly to suboptimal treatment success rates.

Intervention or response: To address this, the Institute of Human Virology Nigeria (IHVN), through the Global Fund PPM grant, in collaboration with the Delta State TB and Leprosy Control Program, implemented a stigma-reduction and psychosocial support intervention from Q1 2021 to Q4 2023.

The intervention aimed to improve treatment outcomes by integrating structured pre-treatment and routine counselling sessions into the care pathway for Drug Susceptible TB (DS-TB) patients.

Key stakeholders engaged included DOTS officers, Local Government TB Supervisors (LGTBLS), treatment supporters, and the patients themselves. A series of capacity-building sessions were conducted to train healthcare providers on effective counselling techniques, patient-centered communication, stigma identification, and emotional support.

In addition, feedback mechanisms such as quarterly patient satisfaction interviews and focus group discussions were used to evaluate patient experiences, inform counselling content, and promote continuous quality improvement.

Results/Impact: The number of Drug-Susceptible-TB (DS-TB) patients enrolled in treatment increased from 395 in 2021 to 1,313 in 2023. Corresponding treatment success rates improved steadily from 69%(274/395) in 2021, to 78%(778/993) in 2022, and 86%(1,135/1,313) in 2023.

Patients reported reduced stigma, improved self-confidence, and greater willingness to complete treatment. Health providers demonstrated increased capacity to offer supportive, stigma-sensitive care.

Conclusions: Targeted pre-treatment and routine-counselling addressing stigmatization significantly improved treatment outcomes. This patient-centered approach is a scalable, low-cost strategy for addressing stigma-related barriers and should be integrated into national TB programs, particularly within PPM models and high-burden settings.

EP41-1092-20 NGO experience in expanding video-DOT support for people with TB via smartphone provision in Ukraine

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Background and challenges to implementation: Video-DOT (vDOT) is an innovative solution, allowing patients to take their medication at home while healthcare providers monitor them remotely via video calls. However, factors such as stigma, long travel distances, lack of transportation, and busy schedules create barriers to consistent treatment monitoring. As technology becomes more widely accessible, vDOT has gained traction as an alternative, leveraging smartphones and internet access to make treatment more flexible and accessible.

However, limited smartphone access, especially in rural and low-income communities, remains a barrier. Even when devices are available, some patients struggle to use video platforms without guidance.

Intervention or response: To address these barriers, an NGO initiative in Ukraine focused on expanding vDOT support for TB patients by providing smartphones. The key components of the intervention include:

1. Provision of smartphones;
2. Remote monitoring;
3. Training and support;
4. Continuous engagement;
5. Addressing stigma;
6. Integration with local health systems;
7. Monitoring and evaluation.

Results/Impact: Since June 2024, the vDOT expansion initiative has been implemented under the Global Fund project by CO „100 PERCENT LIFE" in two regions of Ukraine.

A total of 74 TB patients, including 22 with drug-resistant TB and 52 with drug-sensitive TB, received smartphones. The intervention aimed to enhance adherence and improve outcomes through remote monitoring. Of the 74 patients, 50 successfully completed treatment, 3 died and 3 were lost to follow-up. This approach demonstrates the potential of using technology to support TB treatment in underserved areas, though challenges like retention and mortality persist.

Conclusions: NGOs providing smartphones for vDOT is a transformative approach in the fight against TB. By integrating technology into treatment, NGOs bridge the gap between patients and healthcare providers, ensuring adherence even when clinic visits are difficult.

This approach not only strengthens TB control but also highlights the role of digital health in overcoming delivery challenges in resource-limited settings.

EP41-1093-20 Understanding mental health of individuals who successfully complete their anti-TB treatment: A study from Pune City, India

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Background: Tuberculosis (TB) remains a major public health challenge and India carries a fourth of the global burden of TB. The World Health Organization reports that >40% of patients with TB face depression and other mental health issues.

However, there is a dearth of literature on mental health of cured individuals. Our study aimed at exploring this issue.

Design/Methods: The study was cross-sectional. We randomly selected 100 individuals [(27 with multidrug-resistant TB (MDR-TB) and 73 with non-MDR-TB)] who recently completed their anti-TB treatment under the National TB Elimination Program (NTEP) in Pune. These individuals were interviewed using Diagnostic and Statistical Manual (DSM-5).

Data on depression, anxiety, somatic symptoms, suicidal ideation, and psychosis were analysed using Fisher's exact and Chi-square tests, while the logistic regression assessed the odds of mental health conditions between the two groups.

Results: Depression was more significant in Non-MDR-TB group than MDR-TB (20.5% vs 3.7%; P=0.02). Anxiety was reported 'mild' in both groups (74%). Over two-thirds of individuals experienced somatic symptoms (Non-MDR-TB: 71.2%, MDR-TB: 66.7%).

Psychotic symptoms (41.1% vs. 25.9%) and suicidal ideation (54.8% vs. 37%) respectively were also higher in Non-MDR-TB group. Logistic regression showed significantly higher odds of depression (OR = 4.70, [95% CI: 1.5,

15.2]; P= 0.01) in Non-MDR-TB, while other associations were not statistically significant. Our study showed individuals with non-MDR-TB seemed to have a higher mental health burden than those with MDR-TB.

Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge and India carries a fourth of the global burden of TB. The World Health Organization reports that >40% of patients with TB face depression and other mental health issues. However, there is a dearth of literature on mental health of cured individuals. Our study aimed at exploring this issue.

Conclusions: Our study indicates mental health burden even among cured individuals. Most non MDR-TB individuals had first-time encounter to TB and their lack of ability to cope up with the disease seemed to affect their mental health.

On the contrary, many individuals with MDR-TB have prior experience of anti-TB treatment and disease coping ability. Our study underscores the need for organising mental health services for the cured individuals as needed.

EP41-1094-20 Enhancing drug-resistant TB treatment compliance through community support: Lessons learned from the community-based drug-resistant programme in Indonesia

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Background: Drug-resistant tuberculosis (DR-TB) elimination in Indonesia remains a challenge, especially in increasing successful treatment outcomes. Despite the treatment from healthcare, community-based patient support also plays a vital role in ensuring DR-TB treatment enrollment and adherence.

Penabulu-STPI Consortium as Principal Recipient of The Global Fund has been supporting DR-TB patients primarily through routine community assistance since the patient was diagnosed in 30 provinces and 190 districts in Indonesia.

Design/Methods: This study was conducted in a cohort retrospective by using routine data from Patient Supporters reported monthly. It analyzed the DR-TB newly confirmed cases from January -December 2024 received through a data interoperability mechanism with the National TB Information System and assisted during the same period. Successful community assistance was defined as the patient who enrolls in the treatment within 2 months after diagnosis and has completed the treatment. Descriptive analysis and logistic regression were performed to identify the predictors of successful community assistance.

Results: There were 2,965 DR-TB confirmed cases that met the sample criteria. As many as 71,1% have enrolled, with 52,1% starting the treatment within 2 months after diagnosis. Among those, 50,9% have completed the treatment, and the remaining were lost to follow-up, treatment failures, and passed away.

The patients who were assisted 4-5 times every month (aOR: 4,9, CI: 3,1 – 7,7, p: 0,001), assisted by face-to-face and virtual sessions including home visits at least 1 time every month (aOR: 10,08, CI: 6,8 -14,8, p: 0,001), and had upper secondary school (aOR:1,4, CI: 1,1 – 1,8, p: 0,021) more likely to have a successful treatment compared to those assisted less than 4 times without home visits and lower education level.

Background and challenges to implementation: Increasing treatment enrollment and completion of drug-resistant tuberculosis (DR-TB) in Indonesia remains a challenge. Despite the treatment from healthcare, community-based patient support also plays a vital role in ensuring DR-TB treatment enrollment and adherence. Penabulu- STPI Consortium as Principal Recipient of The Global Fund has been supporting DR-TB patients through routine community assistance in 30 provinces and 190 districts in Indonesia.

Intervention or response: Penabulu-STPI Consortium has started providing support to DR-TB patients as early as the patient was diagnosed and conducted the routine community assistance in-person sessions, also distributing "enabler" funds to support the cost incurred due to the enrollment and treatment process. We analyzed data collected from the monthly activity report of DR-TB patient assistance from January to December 2024.

Descriptive analysis and multiple logistic regression were performed to identify the aspects of community intervention that determined timely enrollment (within 2 months after being diagnosed) and successful treatment.

Results/Impact: 2,965 newly confirmed DR-TB cases were assisted in 2024 and ended the treatment in March 2025. Among 1511 cases (51%) who enrolled timely and completed the treatment, 81,4% assisted with in-person sessions 2-4 times each month, 86.3% with home visit sessions, and 80,9% received enabler support regularly.

Multivariable analysis shows that the patients who were assisted in-person weekly, including home visits, were more likely to have a timely enrollment and successful treatment compared to those assisted bi-weekly or less and without home visits (aOR: 4,9, CI: 3,1 – 7,7, p: 0,001).

The treatment side effects, patient supporters' coverage, geographical situation, and patients with frequent travel are the main challenges in providing intensive community support.

Conclusions: Community support through weekly in-person sessions, including home visits, has proven effective in improving drug-resistant enrollment and treatment completion. Collaboration with the local government, healthcare, and cross-sectoral partners needs to be strengthened in improving the patient-centered DR-TB support.

EP41-1095-20 The TRIO model: A community-led triad approach to improve TB adherence and psychosocial support in Zambia

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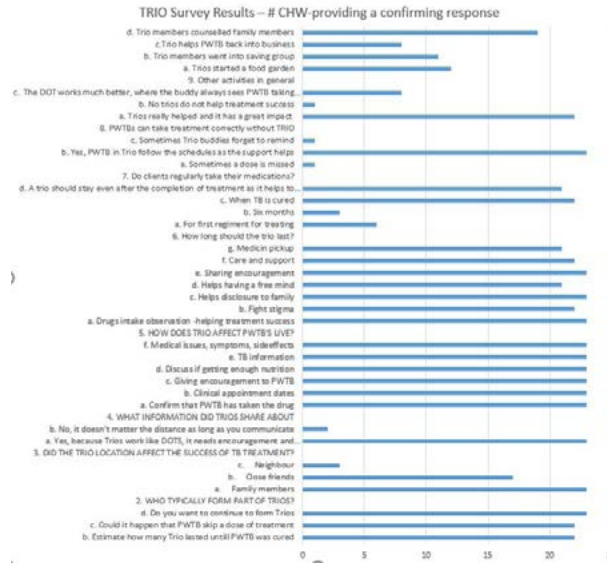
Background and challenges to implementation: Tuberculosis (TB) remains a leading cause of mortality in Zambia, with an incidence case of 283/100,000 people. Despite high TB treatment success rates (93% for new/relapse cases, 2022), treatment non-adherence remains a barrier to successful treatment outcomes. Stigma, economic barriers, misinformation and fragmented support systems lead to high loss to follow-up and drug resistance.
Intervention or response: To address this, DAPP (local NGO) implemented an innovative TRIO model — a person-centred intervention pairing people with TB (PWTB) with two treatment supporters (family members/trusted friends) (n=2,752) to strengthen adherence and social support in three high-burden districts of Lusaka (2022–2024).
The TRIO model integrates evidence-based strategies shown to improve adherence through peer support including:
1. Structured support groups where person on treatment shares experiences and receives support.
2. Family direct observation therapy (C-DOT), ensuring treatment adherence in a non-coercive manner.
3. Health literacy, empowering people to take ownership of their health.
4. CHWs peer paired- support to PWTB addresses barriers early.
Program evaluation was conducted using structured interviews with 23 CHWs out of 50 after two years of program across three districts with 1,5 million populations.
Results/Impact: CHWs reported that all 1,376 PWTB forming a TRIO completed their treatment. CHWs indicated that TRIOs improved family knowledge, support for PWTB and reduced stigma. PWTB experienced increased care, support and mental well-being. CHWs reported improved nutrition and faster recovery. These results, higher than baseline, contrast with a 90% completion rate in control shanty compounds of Lusaka without the TRIO model. See Table 1.



Conclusions: The TRIO model demonstrates the potential of community-led interventions to strengthen resilience and promote long-term engagement in TB care. To further scale this intervention, it is recommended: Policy advocacy to incorporate TRIOs into national TB adherence strategies under community health. Continuous routine training for healthcare providers to embed TRIO approaches in routine TB care.

EP41-1096-20 Barriers and facilitators in TB nutritional support: A CFIR framework-based qualitative study of TB champions' experiences with Nikshay Poshan Yojana and Nikshay Mitra Yojana

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Background: Nutrition is an important aspect of TB healing. In India, Nikshay Poshan Yojana (NPY) is implemented by the National TB Elimination Programme (NTEP) for financial support, while Nikshay Mitra Yojana (NMY) brings more of a community-based support. The present study intended to look for implementation and effectiveness of these schemes in the experiences and perceptions of TB Champions.

Design/Methods: This qualitative descriptive study used semi-structured in-depth interviews with 16 TB Champions in India. Data were analyzed using thematic analysis and framed along the five domains of the Consolidated Framework for Implementation Research (CFIR) which helped elicit barriers and facilitators in the implementation of NPY and NMY as viewed by these key community actors.
Results: Key Insights from the TB champions
NPY: Champions appreciated NPY's financial aid but reported frequent delays and inconsistencies in the disbursement of funds, decreasing its impact.
NMY: NMY enabled community support but it was also affected by irregular and unequal assistance due to the voluntary nature of donors.
Outer setting: Stigma, socio-economic barriers, and limited awareness among patients hindered the use of the scheme.
Inner setting: In health care system settings, poor coordination across the gaps and lack of support from staff acted as barriers toward effective implementation.
The role of TB Champions: Champions have played the greatest role in lobbying for patients but have been burned out, inadequately trained, and never formally acknowledged or compensated.
Implementation Process: Challenges included the limited usability of the Nikshay portal and poor monitoring and feedback systems. There socio-geographic challenges further hinders the uptake of the scheme by the rural population.
Conclusions: The study unravels fundamental gaps of implementation in NPY and NMY which inhibit effective nutritional support. Real-time fund tracking, standard support packages, training and stipends for TB Champions, community-based enrollment, and structured partnerships creating a stronger person-centered TB care are recommended.

EP41-1097-20 TB and social protection: Coverage and execution of the Food Assistance Programme in the State of Rio de Janeiro, Brazil

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Background: Tuberculosis (TB) is a socially determined disease, with treatment adherence strongly influenced by socioeconomic conditions. To mitigate these effects, the state of Rio de Janeiro implemented the Food Assistance Program for individuals undergoing treatment for drug-susceptible TB (PAATB). This study aimed to analyze the coverage and magnitude of PAATB implementation by municipality, in order to identify critical areas for strengthening social support actions.
Design/Methods: This descriptive study used 2024 data from the Food Assistance Support System (SISAA-RJ). All municipalities with granted benefits were analyzed. Coverage was calculated as the proportion of active benefits relative to those granted, and classified as high (≥80%), moderate (60–79%), or low (<60%). Municipalities were ranked by the volume of benefits granted to highlight those with the greatest programmatic impact.

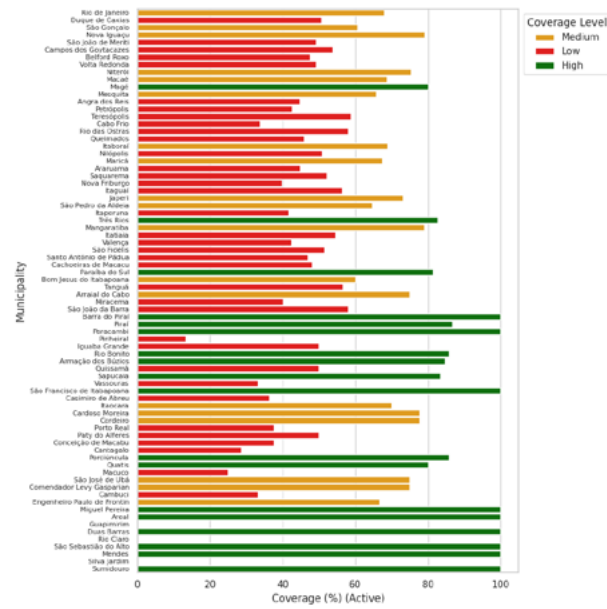

Figure 1 - Benefit Coverage and Volume by Municipality – PAATB, Rio de Janeiro, 2024.

Results: More than 10,000 benefits were granted across the state. The highest volumes were concentrated in the municipalities of Rio de Janeiro, Duque de Caxias, and São Gonçalo. Despite the high number of concessions, these areas showed only moderate or low coverage. The figure illustrates that municipalities with the greatest TB burden also face significant challenges in sustaining benefit provision, which may compromise treatment adherence and overall effectiveness.
Conclusions: The analysis revealed mismatches between the scale of program execution and the quality of support continuity. Identifying municipalities with low coverage and high programmatic impact is crucial to reorient intersectoral strategies and ensure continuity of patient-centered TB care.

EP41-1098-20 Impact of livelihood support on the treatment of drug-resistant TB: An excerpt from rural India

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Background and challenges to implementation: Drug Resistant-Tuberculosis remains a social disease closely tied to poverty. Financial hardships, job insecurity and healthcare costs contribute to poor treatment outcomes. Integrating interventions that enable PwDRTB to bolster their livelihood status and enhance their treatment compliance are needed.
Intervention or response: To restore the lost livelihood due to the diagnosis of DR-TB, a livelihood initiative was implemented among PwDRTB and their family members in 3 rural districts of Bihar, under TB Reach Wave 9 project.
Monetary support in range of $33 to $105 was provided to set up mini-shops, vegetable shops, sewing machines and accessories, and other prospects. Amongst PwDRTB initiating their treatment between 2022 and 2024, livelihood support was provided to 101 PwDRTB or their family members.
Results were compared between the ones receiving the support and the ones who didn't receive it within the same geography and similar socio-economic conditions.
Results/Impact: An increase of 6% in the median income of family earned from the first month (Median $11.69, IQR $11.69) to the sixth month (Median $12.49, IQR $11.01) after providing livelihood support was evident. 89% of PwDRTB successfully completed their treatment among the outcomes declared.
Contrasting treatment success (72%) was evident in those not provided with livelihood support (p<0.05, OR 0.322 95% CI 0.145-0.716).

	Livelihood support provided (n=90)		Livelihood support not provided (n=93)	
	Males (n=29)	Females (n=61)	Males (n=71)	Females (n=22)
Successfully treated	24 (83%)	56 (92%)	50 (70%)	17 (77%)
Unsuccessful outcome	5 (17%)	5 (8%)	21 (30%)	5 (23%)

Table. Treatment outcomes of Livelihood support provided v/s Livelihood support not provided.

Conclusions: Our findings suggest that the sustainable person-centered care of livelihood support improved PwDRTB's family income. It positively impacts treatment outcomes with 89% of the PwDRTB provided with livelihood support successfully completing the treatment and a lower probability of an unsuccessful outcome.

EP41-1099-20 Leveraging community treatment supporters (CTS) to improve TB treatment outcomes: Evidence from Papua New Guinea's urban TB response

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Background and challenges to implementation: Papua New Guinea (PNG) has one of the highest tuberculosis (TB) burdens in the Western Pacific, with an estimated 44,000 cases in 2022 and an incidence rate of 432 per 100,000 population (WHO Global TB Report 2023). The National TB Strategic Plan aims to reduce this to 350 per 100,000 by 2026. Achieving this requires improved treatment outcomes, yet the national treatment success rate averages only 74% (range: 42–94%) due to persistent challenges in accessibility, affordability, and availability of services.
Intervention or response: World Vision implements the Global Fund TB grant across 12 of PNG's 21 provinces. To strengthen the TB care cascade, Community Treatment Supporters (CTS) were introduced. These trained and incentivized volunteers—often former TB patients—support active case finding, contact tracing, patient referrals, and directly observed treatment (DOTS).

To assess the CTS model's effectiveness, we compared treatment outcomes in two urban provinces with similar TB caseloads. In the National Capital District (NCD), the CTS program has been operational for several years, transitioning from World Bank to Global Fund support. In 2024, 94 CTS volunteers managed 30–40 patients each, receiving a monthly stipend of 720 PNG Kina (~USD 173). In contrast, Morobe Province only introduced CTS in 2024, and the program is not yet fully integrated into the health system.

Results/Impact: NCD's mature CTS program achieved a treatment success rate of ~90%, compared to ~77% in Morobe. The structured, community-led approach in NCD improved treatment adherence, follow-up, and case management. In Morobe, limited rollout and supervision have restricted program impact, though there is strong potential for scale-up.

Conclusions: Engaging Community Treatment Supporters shows good promise in urban TB control. Scaling up this approach in high-burden areas like Morobe, with strong supervision and sustainable incentives, is key to achieving national TB targets.

EP41-1100-20 Acceptability of integrated TB, hypertension and diabetes screening in health facilities and active case finding in Cambodia

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Background and challenges to implementation: Integrated service delivery (ISD) aims to improve healthcare access and efficiency, particularly in high-burden settings. This study assessed acceptability of ISD for TB and non-communicable disease (NCD) screening for hypertension and diabetes mellitus (DM) in Cambodia.

Intervention or response: A TB Reach-funded ISD project (Project Boost) was implemented over 20 months in Kampong Chhnang province, integrating screening for TB, hypertension and DM for clients attending health centers and community-based active case finding (ACF) events. During the project's last 5 months (August-December 2024), 110 patients and 90 healthcare workers (HCWs) were recruited for survey questionnaires; 12 patients and 12 HCWs were also selected for in-depth interviews. Data was collected via Khmer-language questionnaires and interviews, with responses translated and analyzed by a social anthropologist using Sekhon's framework of acceptability.

Results/Impact: High ISD acceptability was found among both HCWs and patients. HCW acceptability was primarily driven by perceived higher quality and effectiveness of care (>90% reporting ISD saved time/money for clients and enabled HCWs to deliver better care). Patient acceptability was linked to convenience and benefits (99% reported time/effort savings and improved impression of healthcare quality).

Both groups cited distance to health center and long wait times as barriers to care, which ISD addressed. While HCWs perceived ISD as more time-consuming, >90% reported seeing clients in <30 minutes, and 98% preferred delivering multiple services simultaneously.

The main challenge for HCWs was inconsistent NCD commodity availability. ACF events were favorably perceived by clients as significantly closer to home than health centers. 98% of people diagnosed with TB felt ISD contributed to earlier TB diagnosis.

Conclusions: ISD for integrated TB/NCD screening demonstrates high acceptability among Cambodian HCWs and patients. Integrating services is feasible and addresses key barriers to care. Successful scale-up, however, requires improved coordination across national disease programs, particularly for reliable commodity supply.

EP42 Innovating TB care: Triage, technology, mobility and workforce solutions for better outcomes

EP42-1101-20 Role of triage audit in an ongoing differentiated TB care initiative to reduce TB deaths in Tamil Nadu, India

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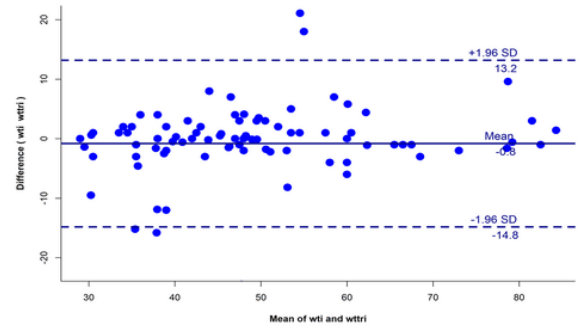
Background: Starting April 2022, Tamil Nadu implemented the Tamil Nadu-*Kasanoi Erappila Thittam* (TN-KET), India's first state-wide differentiated TB care initiative aimed at reducing TB deaths. All adults (≥15 years) with drug-sensitive TB notified from public facilities are triaged at diagnosis. Those identified with very severe undernutrition, respiratory insufficiency or poor performance status (triage-positive) are prioritized for comprehensive assessment and inpatient care. Despite achieving targets of triage coverage (>90%) and admission rates (>90% among triage-positive patients), 11 districts failed to meet 30% relative reduction in TB death rates. Suboptimal triaging quality could be a potential reason behind this shortfall.
Design/Methods: For those diagnosed between July 2022 and June 2023 in all 30 districts, we investigated the accuracy of triage coverage by comparing true triage coverage, calculated by tracking eligible from *Ni-kshay* to TB SeWA (Severe TB Web Application of TN-KET), with the reported triage coverage based on aggregate numbers reported in quarterly performance reviews. During a triage audit conducted between October 2024 and February 2025 in 11 districts, TB SeWA triaging data was compared with investigator's triaging data (repeat assessments in field) within few weeks of diagnosis.
Results: Distirct level reported triage coverage was higher (14-17%) than the true triage coverage. Of 91 assessed, body mass index values differed significantly, with a mean difference of 3 kg/m² (SD 1.4) between TB SeWA data and investigator assessment. It was higher in TB SeWA data, highlighting potential inaccuracies. While SPO_2 (oxygen saturation) and respiratory rate were consistently documented, only 27% persons with TB reported leg swelling assessments having being done during triaging.

Figure. Bias and agreement limits for weight measures in triage audit conducted in Tamil Nadu, 2024-25



Conclusions: Districts not achieving TB death rate reduction should cross-check their reported triage coverage with true triage coverage and randomly cross-check TB SeWA triage data. Over time, this should improve triage quality, increasing the chances of adults with TB receiving appropriate care.

EP42-1102-20 Why oxygen plants fail: A case study from The Gambia

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Background: Reliable medical oxygen access is critical but remains a challenge in many low- and middle-income countries (LMICs). At Edward Francis Small Teaching Hospital (EFSTH) in The Gambia, three newly installed Pressure Swing Adsorption (PSA) plants, intended to ensure local supply, rapidly became non-functional. This study aimed to systematically analyze the root causes of these failures to inform future oxygen system implementations.
Design/Methods: A mixed-methods case study was conducted at EFSTH. We employed a Failure Modes and Effects Analysis (FMEA) framework. Quantitative data were gathered via structured surveys with clinical staff rating failure mode severity, frequency, and detectability. Qualitative data on installation, operational, and maintenance issues were collected through unstructured interviews and site reviews with biomedical technicians. An engineering team performed root cause analysis on the qualitative data, integrated with prioritized FMEA modes.
Results: Multiple critical failure modes were identified across all plants, including catastrophic installation errors (improper wiring/grounding, bypassed filters), component failures (booster explosion), and rapid performance

degradation. Installation within shipping containers with minimal environmental protection likely exacerbated vulnerability to technical failures. Root cause analysis revealed systemic deficiencies: inadequate technical expertise, insufficient training, poor installation oversight (Access); diffuse roles and lack of performance benchmarks (Accountability); and prohibitive financial constraints (severe budget shortfalls hindering maintenance/spares) coupled with inadequate electrical infrastructure (Sustainability). These failures resulted in continued oxygen scarcity, rationing, reliance on unsafe clinical practices, and lack of essential accessories.
Conclusions: The EFSTH case demonstrates that capital investment in PSA plants is insufficient for success. Failures stemmed from neglecting the broader implementation ecosystem. Sustainable oxygen access requires comprehensive planning addressing technical training, installation quality assurance, clear accountability structures, long-term funding for maintenance and operations, and robust infrastructure. A holistic, lifecycle approach is essential for future oxygen system investments in LMICs.

EP42-1103-20 Digital technology use and perceptions of VDOT in TB care in São Paulo State, Brazil

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Background: Following the COVID-19 pandemic, the incorporation of digital technologies into tuberculosis (TB) care has gained prominence, particularly in treatment monitoring and adherence support. Among these innovations, Video Directly Observed Therapy (VDOT) has been proposed as a scalable and potentially cost-effective alternative to traditional in-person Directly Observed Therapy (DOT). However, the successful implementation of such digital health strategies depends on more than technological availability—it requires equitable access to devices, digital literacy, and the sociocultural acceptability of remote monitoring. This study aims to characterize access to digital technologies and examine perceptions of VDOT among individuals undergoing TB treatment in São Paulo State, Brazil.
Design/Methods: This is a descriptive cross-sectional study involving 26 participants diagnosed with active tuberculosis in 2024. Data were collected using an electronic form via REDCap and subsequently analyzed. Variables included smartphone ownership, internet and app usage, familiarity with video recording, and opinions regarding VDOT.
Results: Among participants, 24 (92.3%) owned a mobile phone with internet access, and 22 (84.6%) reported daily use of WhatsApp, indicating a high level of digital connectivity. Furthermore, 20 individuals (76.9%) felt confident recording and sending videos. Despite this, only 9 participants (34.6%) expressed initial interest in engaging with VDOT strategies. Reported reasons for refusal included feelings of embarrassment, fear, or anticipated difficulties with the technology. Although digital infrastructure appears to be in place, VDOT was perceived as feasible by only 11 participants (42.3%), suggesting that sociocultural and usability barriers may significantly influence its acceptance.
Conclusions: Despite the widespread use of smartphones and messaging applications, the acceptance of VDOT remains limited among individuals undergoing tuberculosis treatment in São Paulo. Effective implementation strategies must go beyond technological availability and incorporate culturally sensitive, educational, and patient-centered approaches to support digital adherence.

EP42-1104-20 Evaluation of TB screening coverage among workers in Lagos State

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Background: Insufficient tuberculosis (TB) screening coverage among the working population is concerning. Little to no screening for TB poses health risks such as the continuous spread of TB, underdiagnosis, delayed treatment, emergence of multi-drug-resistant TB, and even death if untreated. Considering that the working population is the most transient and active subset of the society, interacting with colleagues from various parts of Lagos, they are more likely to infect their household with TB if infected at work. The aim of this study was to examine screening coverage among Lagos workers.
Design/Methods: From February to July 2024, a cross-sectional study was conducted using the non-probability sampling method, resulting in 310 consenting adults who work and live in Lagos, Nigeria. A standardized and pretested Google Form questionnaire was used to obtain sociodemographic data (age, gender, highest level of education, local government region, and employment status) from deidentified consenting adults. Descriptive analysis was utilized.
Results: This study revealed 54.8% of the 310 consenting participants have never been screened for TB, with the highest from the information communication technology industry (25.9%), and only 4.8% who were ever screened for TB first learned about TB from the health-care provid-

ers (Table 1). Also, it would have been expected that all workers should have been screened for TB during their pre-employment health screening, but only one participant admitted to being screened prior to employment. These results reveal there is an urgent need for active TB screening (verbally or via portable digital x-ray) in our health-care facilities, including referral health facilities (community pharmacies, laboratories, and patent medicine vendors).

Job Industry	Frequency (N) = 310	Never Screened for TB	Screened for TB and Introduced to TB at Work	Screened for TB and Introduced to TB in School	Screened for TB and Introduced to TB during Pre-employment Health Screening	Screened for TB and Introduced to TB by Friends and Family	Screened for TB and Introduced to TB by Health-Care Provider	Screened for TB and Introduced to TB via Media
Business, Arts and Entertainment	35	21 (12.4%)	0 (0.0%)	7 (7.5%)	0 (0.0%)	2 (12.5%)	1 (6.7%)	4 (28.6%)
Civil Service and Law Enforcement	11	5 (2.9%)	0 (0.0%)	4 (4.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (14.3%)
Education and Agriculture	16	12 (7.1%)	0 (0.0%)	3 (3.2%)	0 (0.0%)	1 (6.3%)	0 (0.0%)	0 (0.0%)
Energy, Manufacturing and Construction	67	34 (20.0%)	0 (0.0%)	21 (22.6%)	0 (0.0%)	5 (31.3%)	4 (26.7%)	3 (21.4%)
Healthcare	77	29 (17.1%)	1 (100%)	33 (35.5%)	0 (0.0%)	7 (43.8%)	6 (40.0%)	1 (7.1%)
Information and Communications Technology	66	44 (25.9%)	0 (0.0%)	17 (18.3%)	1 (100.0%)	1 (6.3%)	1 (6.7%)	2 (14.3%)
Others	33	24 (14.1%)	0 (0.0%)	5 (5.4%)	0 (0.0%)	0 (0.0%)	3 (20.0%)	1 (7.1%)
Services	5	1 (0.6%)	0 (0.0%)	3 (3.2%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.1%)

Table 1: History of Tuberculosis Screening by Job Industry among Lagos State's Workers.

Conclusions: This study was able to examine tuberculosis screening coverage among the workers in Lagos, and this is very significant to limiting the spread of TB, early diagnosis of TB, prompt treatment of TB, early contact tracing, and ultimately ending tuberculosis in the country.

EP42-1105-20 Increasing utilisation rate and access to TB diagnostics through mobile community intervention efforts: A case study of Primary Health Centre, Jaji

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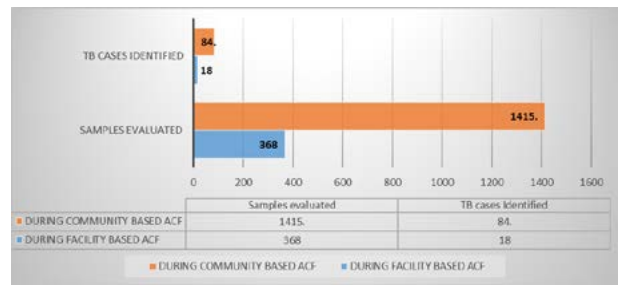
Background and challenges to implementation: Tuberculosis (TB) is the second leading cause of death globally. In 2022, Nigeria ranked first (1st) in Africa and sixth (6th) worldwide, accounting for about 4.5% of the Global TB burden. Active case-finding (ACF) for TB detection, was one of the WHO-recommended strategies for improved TB notification. KNCV Nigeria in partnership with the National TB programme under the New Tools project introduced Truenat diagnostics across 28 facilities in Nigeria for increased ACF activities.
Primary Health Care Center (PHC), Jaji was one of the beneficiaries of this initiative; however, sample evaluation was sub-optimal due to increasing security challenges in the community where the facility is located.
There was need for a different approach to increase utilization through improved diagnostic access. The study aims to display the increased utilization rate of the Truenat platform due to community ACF engagement.
Intervention or response: Stakeholders in the state were engaged for a seamless transition from facility-based ACF to community ACF. Wellness on Keke (tricycle), a mobile intervention for community ACF (spearheaded by KNCV Nigeria) was coupled with the Truenat machine and taken into surrounding communities. On-the-spot screening and testing was conducted during community ACF. All TB cases diagnosed were linked to facility for TB treatment and care.
Results/Impact: Over a 22-month period (December 2021 - September 2023) at facility ACF implementation, 368 samples were tested with 18 TB cases, with a TB yield of 5% however, within a 15-month period of community ACF implementation (October 2023- December 2024), 1415 samples were tested with 84 TB cases, with a TB yield of 6%.



Conclusions: Community ACF efforts contributed to increased diagnostic utilization and TB detection. Decentralized community-centred approaches should be adopted across settings that ensure optimal utilization of TB diagnostics for improved TB notification and maximization of investments.

EP42-1106-20 Enhancing TB treatment outcomes in high mobility, densely populated urban hubs: Scalable lessons from targeted interventions

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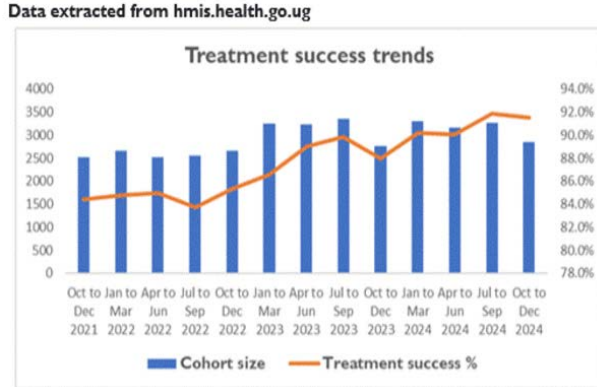
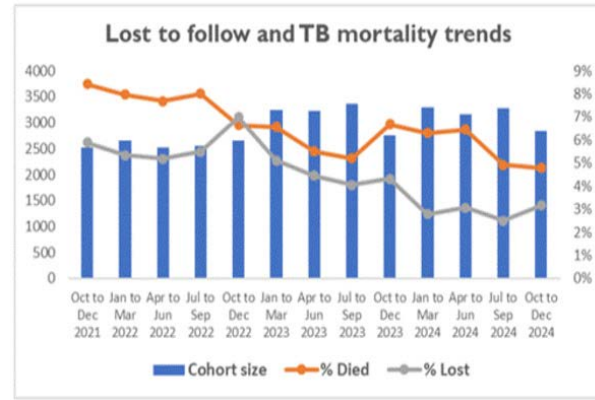
Background and challenges to implementation: In Uganda, optimizing TB treatment outcomes remains a challenge, particularly in urban areas characterized by high population density and mobility. Factors such as TB-related stigma, unstable housing, financial constraints, and restrictive employment terms negatively impacts TB treatment completion. Male patients, accounting for two-thirds of the TB burden further complicates retention strategies given their poor health-seeking behavior.
We present scalable interventions implemented over three years that improved TB treatment outcomes in the complex urban settings of Kampala, Mukono and Wakiso districts in central-Uganda.
Intervention or response: At project inception, the USAID LPHS TB-Activity conducted root cause analyses to identify TB treatment barriers at the patient and health facility levels. We addressed patient level challenges by engaging civil society organizations to provide a package of customized retention interventions at health facilities accounting for 70% of the TB burden, implemented a community drug delivery program and engaged TB survivors to optimize treatment among hard-to-reach populations.
Institutional modalities focused on proactive review of active cohorts, and corrective actions for treatment interruption and TB related deaths, a hub and spoke to functionalize private facilities as TB treatment points and scaleup of promising interventions to other facilities.
Results/Impact: We compared our performance at project inception in October-December 2021 with the October-December 2024 performance. The treatment success among new and relapse patients with TB improved from 84.4% (2,122/2,514) to 91.4% (2,588/2,832). TB associated mortality reduced from 8.4% (212/2,514) to 4.7% (134/2,832).
Loss to follow while on treatment reduced from 6% (148/2,514) to 3.1% (89/2,832). Both TB-associated mortality and treatment interruption were reduced to below the national threshold of <5%. Other patients either failed or stopped while on treatment due to various reasons.

Data extracted from hmis.health.go.ug





Conclusions: Designing community-led patient centered interventions and strengthening systems to proactively respond to treatment barriers in complex urban settings is pivotal in improving and sustaining TB treatment outcomes.

EP42-1107-20 Role of TB preventive therapy in reduction of incidence of TB disease among health workers in Bungoma County, Kenya

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Background: Health care workers (HCWs) are at an increased risk of acquiring tuberculosis (TB) disease compared to the general population, due to occupational exposure. In 2020 Kenya rolled out short term TB preventive therapy (TPT) combination of rifapentine and isoniazid for 3 month for all health care workers after TB screening. We aim to determine the role of TPT in reduction of TB incidence in Bungoma County before and after roll out of TPT.

Design/Methods: Health care workers are symptomatically screened for TB using the World Health Organization (WHO) screening tool biannual. Those who screened positive were investigated for TB using a molecular test, those who test positive for TB were initiated on TB treatment, while those who test negative and those who screened negative were initiated on TPT taken once a week for three month.
Results: The results showed that HCW screening was at 0% in 2017 and 100% in 2022. Health care workers initiated on TPT was 0% in 2017 and 37% in 2024. The results revealed that in 2017 when routine screening and TPT initiation was not being implemented, TB notification rate among HCW was 986 per 100,000 after roll out of TPT in 2020 the TB case notification rate was 786 per 100,000 and in 2024 the TB case notification rate dropped drastically to 240 per 100,000. As shown in table 1.

Year	Total No. of HCW	No. of HCW Screened	No. of HCW who developed TB	No. of HCW put on TPT	TB disease Notification rate among HCW/100,000
2017	**1520**	**0 (0%)**	**15**	**0 (0%)**	**986**
2018	**1825**	**609 (33%)**	**15**	**0 (0%)**	**821**
2019	**1850**	**505 (27%)**	**17**	**2 (0%)**	**918**
2020	**2289**	**650 (28%)**	**18**	**5 (0%)**	**786**
2021	**2500**	**700 (28%)**	**20**	**30 (1%)**	**800**
2022	**4259**	**4259 (100%)**	**21**	**241 (6%)**	**493**
2023	**4620**	**4290 (93%)**	**23**	**1600 (35%)**	**497**
2024	**5000**	**4450 (89%)**	**12**	**1850 (37%)**	**240**

Table 1 Tuberculosis notification rate among health care workers in Bungoma County per year.

Conclusions: Bungoma County has demonstrated that screening of health care worker and initiation of TPT among the HCW has shown a decline in TB notification rate. Policy on HCW screening should be adhered to and those who screened negative should be initiated on TPT as this is likely to reduce incidence of TB among HCW which will reduce onwards TB transmission.

EP42-1108-20 Health care workers screening for TB disease over time in relation to TB mortality in Bungoma County, Kenya

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Background: Tuberculosis (TB) is the leading cause of death from a single infectious agent. Risk of TB disease is higher among health care workers due to close contacts with TB patients. Biannual TB screening is recommended for all health care workers. Those who screened negative are initiated on tuberculosis preventive therapy (TPT). We aimed to assess health care workers screening for tuberculosis disease over time in relation to tuberculosis mortality in Bungoma County.
Design/Methods: This study was carried out in Bungoma County, Kenya. Biannual symptomatic screening of health care workers was done using World Health Organisation (WHO) screening tool. Those who screened negative were initiated on TPT for three month while those who screened positive were evaluated for TB disease by producing sputum for molecular test, those who test positive for TB disease were initiated on TB treatment.
Results: The results showed that in 2017 no HCW was screened for TB, among those who were diagnosed with TB, 53.3% of them died; in 2020 33% of HCW were screened for TB, among those who diagnosed with TB disease 38.9% died. In 2022 100% of HCW were screened for TB, while in 2024 89% of health care workers were screened for TB, non-died while on TB treatment. As shown in table 1.

YEAR	No. of HCW	No. of HCW Screened	No. of HCW put on TPT	No. of HCW who developed TB	No. of HCW who died.	Proportion of HCW who died
2017	1520	0	0	15	8	53.3%
2018	1825	609 (33%)	0	15	10	66.7%
2019	1850	505 (27%)	2	17	7	41.2%
2020	2289	650 (28%)	5	18	7	38.9%
2021	2500	700 (28%)	30	20	6	30%
2022	4259	4259 (100%)	241	21	4	19%
2023	4620	4290 (93%)	1600	23	1	4.3%
2024	5000	4450 (89%)	1850	12	0	0%

Table 1 Screening for TB disease among health care workers in Bungoma County over time.

Conclusions: There was drastic reduction of mortality from tuberculosis among health care workers in Bungoma County with the increase uptake of TB screening. Regular TB screening leads to early identification of TB disease and initiation of treatment leading to favourable treatment outcome and reduce TB transmission. Policy on HCW screening for TB should be followed to the latter.

EP42-1109-20 Strengthening TB detection in high-risk populations: Findings from an intensified screening campaign among Indian mine workers

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Background and challenges to implementation: Mine workers in India are vulnerable to tuberculosis (TB) and Silicosis due to excessive exposure to silica dust, poor working conditions, low wages leading to undernutrition and poor living conditions. Emerging evidence links silicosis to an increased risk of multidrug-resistant tuberculosis (MDR-TB). Despite the high risk, TB remains underdiagnosed and underreported due to lack of health seeking behaviour.
This study assesses a targeted TB screening initiative under the Intensified TB Elimination Campaign across key mining regions in India to enhance early detection and care linkage.
Intervention or response: A multi-sectoral, community-based ACF campaign was implemented from December 2024 to March 2025 in partnership with key ministries and local health authorities. Over 83,000 mine workers were screened using symptom screening, digital chest X-ray, and NAAT testing. Mobile diagnostic vans enabled outreach in remote mining areas. Capacity-building of local health personnel and mining-specific IEC/BCC activities were conducted to support community engagement and improve TB detection among these high-risk occupational group.
Results/Impact: During the campaign, among 83,000 mine workers screened, 36,859 presumptive TB cases were identified. Of these, 2,152 were microbiologically confirmed and 2,625 clinically diagnosed with TB, including 86 drug-resistant TB cases. Over 100% of diagnosed patients were initiated on treatment within 24 hours. TPT was started in 414 individuals. The initiative significantly improved TB case detection—more than doubling yield ($P<0.05$)—compared to passive case finding during the same period in the previous year.
Conclusions: Various studies conducted among mine workers depicted the prevalence of TB ranging from 10.7% to about 32%. In the present study, it was also observed that mine workers 9 % prevalence of TB as well as their MDR-TB 4 % may be due to the delay in diagnosis. Scaling up such interventions will be key to reducing the hidden TB burden and advancing India's journey toward TB elimination.

EP43 Diabetes and ageing in TB: Breaking barriers to better care

EP43-1110-20 Prognostic value of the glycation gap in predicting TB treatment outcomes

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Background: Tuberculosis (TB) patients with diabetes mellitus (DM) often experience poorer treatment outcomes than those without DM, prompting interest in glycemic markers as potential predictors. HbA1c reflects average glucose over the past three months, while fructosamine captures a shorter, three-week window. The glycation gap—defined as the difference between observed HbA1c and the HbA1c predicted from fructosamine—has shown promise prognostic value in critical care settings. However, its relevance to TB treatment outcomes remains unexplored.
Design/Methods: We analyzed data from two independent studies conducted in Lima, Peru. The first study was a nested case-control study, comprising 21 TB patients with poor outcomes and 149 with good outcomes. The second was a cohort study including 61 patients with poor outcomes and 1,588 with good outcomes.
We retrospectively measured HbA1c and fructosamine from stored blood samples collected at TB diagnosis. The glycation gap was calculated as the difference between observed and predicted HbA1c calculated by fructosamine levels. We standardized these indicators (z-scores) to enable comparison of effect sizes. In the cohort study, we also assessed prognostic performance of these indicators on treatment outcomes using AUC.
Results: In the case-control study, we found that each unit increase in the standardized baseline glycation gap was associated with increased odds of treatment failure (OR=2.27; 95%CI:1.45–3.56), while neither HbA1c (OR=1.12; 95%CI:0.76–1.65) nor fructosamine (OR = 0.59; 95% CI:0.03–1.34) were significantly associated. In the cohort study, all indicators were associated with treatment outcome: glycation gap (OR=1.92; 95%CI:1.57–2.35), HbA1c (OR=1.24; 95%CI:1.01–1.52), and fructosamine (OR=0.66; 95%CI:0.43–1.00). However, the glycation gap demonstrated superior prognostic value (AUC=0.788) compared to HbA1c (AUC=0.634) and fructosamine (AUC=0.664).

Conclusions: The glycation gap shows greater prognostic value for TB treatment outcomes than HbA1c or fructosamine alone, suggesting its potential role in guiding the clinical management of TB patients.

EP43-1111-20 Investigating the association between TB infection and multimorbidity in people with diabetes

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Background: The World Health Organisation has not issued a recommendation for tuberculosis (TB) preventive therapy for people with diabetes because of unclear benefits versus risks. Knowledge gaps exist on the interplay between TB infection (TBI) and multimorbidity in diabetics. People with both diabetes and TBI may have additional comorbidities and risk factors associated with TB, making them particularly vulnerable, yet data on this population is limited.
Design/Methods: We enrolled 673 adults with diabetes attending routine primary care in Khayelitsha, South Africa. We collected data on non-communicable diseases (NCD), TB, and risk factors for both conditions (e.g. smoking and alcohol use). Participants were also tested for TB infection using interferon-gamma release assays. We compared the prevalence of NCD and risk factors by TB infection status, adjusting for age and sex.
Results: The median age was similar between TBI-positive and TBI-negative groups (54 vs 53 years). The prevalence of hypertension was high in both groups (88.6% in TBI-positive and 88.5% in TBI-negative, OR: 1.02, 95% CI 0.57-1,79), as was the prevalence of poor glycaemic control (Hba1c ≥ 7%), which affected 85.9% of TBI-positive and 82.2% of TBI-negative individuals (OR: 1.31, 95% CI 0.82-2.09) (Table). Dyslipidaemia was more prevalent among TBI-positive individuals (OR: 1.46, 95% CI 1.03-1.16).
In TBI-positive and negative groups, 38.9% and 35.6%, respectively, had at least two TB risk factors, and 57.2% and 51.3% had at least two NCD comorbidities. Both the number of TB risk factors and the number of NCD comorbidities were similar between the two groups.

	TBI positive (n=437)	TBI negative (n=202)	Odds ratio (95% CI)[1]
Male (%)	167/437 (38.2)	58/202 (28.7)	NA
Current Smoking (%)	19/412 (4.6)	6/191 (3.1)	1.13 (0.43-3.01)
HbA1c ≥ 7% (%)	354/412 (85.9)	157/191 (82.2)	1.31 (0.82-2.09)
CKD stage 3 or higher (%)	34/412 (8.3)	10/191 (5.2)	1.64 (0.78-3.44)
Hypertension (%)	365/412 (88.6)	169/191 (88.5)	1.02 (0.57-1.79)
Dyslipidaemia (%)	233/412 (56.6)	91/191 (47.6)	1.46 (1.03-2.07)
# of TB risk factors[2]: 0 1 2 or more	31/411 (8.0) 218/411 (53.0) 160/411(38.9)	17/191 (8.9) 106/191 (55.5) 68/191(35.6)	1.05 (0.74-1.48)[4]
# of NCD comorbidities[3]: 0 1 2 or more	20/411 (4.9) 156/411 (38.0) 185/411(57.2)	10/191 (5.2) 83/191 (43.5) 75/191(51.3)	1.27 (0.89-1.80) 4

[1] Adjusted for age and sex; [2] TB risk factors include smoking, alcohol use, HIV, >=HbA1c 7%, low weight, CKD stage 3 or higher, Blood, organ, malignant diseases; [3] NCD comorbidities include CKD stage 3 or higher, hypertension, dyslipidaemia, COPD, cardiovascular diseases, asthma, Blood, organ, malignant diseases; [4] Using ordinal regression

Table. TB risk factors and NCD comorbidities by TBI status.

Conclusions: Participants with both diabetes and TB infection had multiple TB risk factors and concurrent NCD comorbidities beyond diabetes. Although the prevalence was similar regardless of TBI status, the additional vulnerability due to these conditions highlights a need for targeted TB preventive strategies.

EP43-1112-20 Impact of glycemic control on treatment outcomes in rifampicin-resistant people with TB and with diabetes mellitus: Preliminary data from China

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Background: Treating rifampicin-resistant tuberculosis (RR-TB) in patients with diabetes mellitus (DM) remains challenging, with a higher risk of poor treatment outcomes.
Design/Methods: Patients aged 16–75 years old with pulmonary RR-TB were prospectively enrolled and received a 9-month oral regimen containing five of the following drugs: bedaquiline, fluoroquinolones, linezolid, cycloserine, clofazimine, and pyrazinamide. DM was diagnosed based on medical history. Poor glycemic control was defined as the presence of a fasting glucose ≥7mmol/L, or a non-fasting glucose ≥10mmol/L, or HbA1c ≥7.0% at more than half of all follow-up points. Definitions of treatment outcome were consistent with the 2022 WHO guidelines. The association between glycemic control and treatment outcomes was analyzed with logistic regression modelling methods. All patients included in the current analysis have completed treatment.

Results: Among 809 RR-TB patients, 109 (13.5%) had diabetes mellitus, with the majority (95/109, 87.2%) diagnosed with type 2 DM. Twenty-nine (26.6%) patients received an antidiabetic therapy including metformin. Poor glycemic control during treatment was observed in 39.4% (43/109) of patients. Baseline demographic characteristics were balanced between those with optimal and poor glycemic control. Treatment success rates were significantly lower in RR-TB patients with poor glycemic control compared to those with optimal control (60.5% vs. 80.8%, P = 0.004), driven by a higher rate of loss to follow-up (25.6%) and treatment failure (14.0%). Multivariate analysis revealed that poor glycemic control during treatment was independently associated with reduced odds of treatment success (adjusted OR = 0.292, 95% CI 0.108–0.792, P = 0.016). However, baseline hyperglycemia (adjusted OR = 0.705, 95% CI 0.157–3.174, P = 0.649) and metformin use (adjusted OR = 2.220, 95% CI 0.666–7.400, P = 0.194) did not have a significant impact on treatment outcomes.

Table 1. Glycemic control and treatment outcome in RR-TB patients

	Optimal glycemic control (N = 66)	Poor glycemic control (N = 43)	P value
Age, Mean ± SD	51.4 ± 11.7	49.3 ± 8.2	0.264
Male — no. (%)	50 (75.6)	38 (88.4)	0.103
BMI — no. (%)			0.539
Underweight	9 (13.6)	4 (9.3)	
Normal weight	44 (66.7)	27 (62.8)	
Overweight	13 (19.7)	12 (27.9)	
Type 2 DM — no. (%)	56 (84.8)	39 (90.7)	0.372
Treatment with metformin — no. (%)	14 (21.2)	15 (34.9)	0.284
Baseline HbA1c, %, Median (range)	9.4 (5.8, 13.8)	10.6 (7.7,19.9)	0.026
Prior TB treatment history — no. (%)	26 (39.4)	19 (44.2)	0.619
Fluoroquinolone resistance — no. (%)	20 (30.3)	8 (18.6)	0.172
Bilateral disease extent — no. (%)	52 (78.8)	37 (86.0)	0.339
Cavitation — no. (%)	58 (87.9)	33 (76.7)	0.126
Positive baseline smear — no. (%)	48 (72.7)	33 (76.7)	0.639
Treatment outcome— no. (%)			0.004
Treatment success	56 (84.8)	26 (60.5)	
Treatment failure	0	6 (14.0)	
Relapse	2 (3.0)	0	
Lost to follow-up	5 (7.6)	11(25.6)	
Death	3 (4.5)	0	

¶ Treatment failure was determined based on symptoms and chest radiography, and participants were switched to longer regimen.

Conclusions: Poor glycemic control during RR-TB treatment significantly reduces treatment success rates, highlighting the need for optimized diabetes management.

EP43-1114-20 Challenges of diabetes mellitus and drug-resistant TB co-management in Indonesia: A qualitative study

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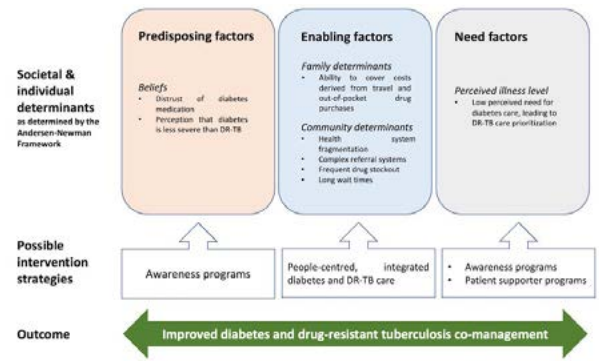
Background: Although diabetes mellitus is associated with higher mortality among people with drug-resistant tuberculosis (DR-TB), its care remains underutilized. One reason might be its fragmentation from the Programmatic Management of DR-TB (PMDT). In Indonesia, where the prevalence of diabetes among people with tuberculosis reaches almost 20%, diabetes treatment is mostly provided in primary care settings, while DR-TB management is given in PMDT hospitals.
This research aims to understand the challenges experienced by people with DR-TB in diabetes and DR-TB co-management.
Design/Methods: This qualitative study follows the Andersen-Newman Framework on the societal and individual determinants of healthcare utilization.
The framework divides the determinants into three categories: (a) predisposing factors, (b) enabling factors, and (c) need factors.
From July-October 2024, two researchers interviewed 16 people with DR-TB and diabetes from three PMDT hospitals in Bandung, Indonesia, representing different types of diabetes care: (a) referral to primary care; and (b) 'one-stop shop' approach. Coding and analysis of verbatim transcripts were conducted using Atlas.ti.
Results: Multiple challenges were experienced by people with DR-TB in accessing diabetes care. Predisposing factors include health beliefs, comprising distrust of diabetes medication and the perception that diabetes is less severe than DR-TB. These factors led to the perceived need to prioritize DR-TB management over diabetes care. Healthcare fragmentation led to complex referral systems, additional travel costs, and long wait times, further exacerbating this prioritization. Frequent diabetes drug stockout was also reported, leading to out-of-pocket drug purchases. The' one-stop shop' approach was also reported as challenging, as the model involved visiting two polyclinics, leading to long wait times that discouraged people with DR-TB from accessing diabetes care.



Conclusions: The fragmentation of diabetes care and DR-TB management, coupled with a low understanding of diabetes, caused inoptimal co-management of diabetes and DR-TB. Approaches to reducing this fragmentation should be people-centred, addressing their perceptions, costs and comfort.

EP43-1115-20 Challenges of caregivers of people with TB and diabetes (PwTB-DM) seeking care from the private sector in Chennai - A cross-sectional descriptive study

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Background: Diabetes is a major comorbidity of TB in Tamil Nadu, affecting 26% of people with TB (PwTB). Caregivers play a vital role in supporting PwTB with diabetes (PwTB-DM), yet limited information exists on the challenges they face. Understanding these challenges is essential to engage caregivers meaningfully and improve outcomes among PwTB-DM.
This study aims to explore the roles and responsibilities of caregivers in managing the disease and identify the barriers they encounter while supporting individuals living with both TB and diabetes.
Design/Methods: A cross-sectional study was done among caregivers of PwTB-DM seeking care through the private sector engagement model in Chennai, India. We reached out to 201 caregivers using simple random sampling. A structured questionnaire was used for data collection. Written informed consent was obtained. Data was collected using the EpiCollect application and analyzed using SPSS 22.
Results: Data was collected from 201 caregivers, with 71.6% (n=144) females and 26% in the 31-40 age group. Around 18% (n=37) had diabetes themselves. Caregiver responsibilities included emotional support (61.7%), accompanying to doctor visits (81%), food preparation (68%), and monitoring blood glucose (53%). Perceived challenges of PwTB-DM reported by caregivers included financial constraints (45%), stress (39%), adhering to a healthy diet (52.7%), and medication adherence to both TB & Diabetes (48%). Regarding the impact on caregivers, 49% felt that caregiving led to stress, 41% reported financial strain, 24% experienced physical health effects, and 34% noted that it positively strengthened their relationship with the affected person. The challenges of caregiving are shown in Figure 1.

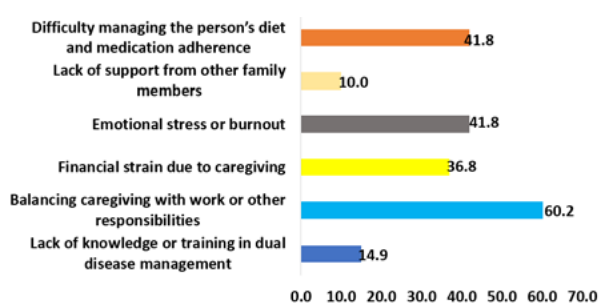

Figure 1. Challenges in caregiver role (n=201).

Conclusions: This study is one of its first kind to study the challenges of caregivers of PwTB-DM. It highlights the challenges and burden of caregivers for PwTB-DM, emphasizing their vital role in care. It calls for measures to reduce caregiver burden by family-centric counselling and support.

EP43-1116-20 TB in the elderly: A growing challenge and the need for specialised care in Anambra State

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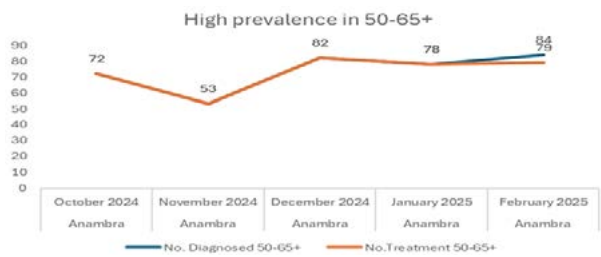
Background and challenges to implementation: Tuberculosis (TB) among the elderly is becoming a serious public health issue in Anambra State. Older adults are more at risk due to aging, weaker immune systems, and other existing health conditions. TB in this age group often shows unusual symptoms, which can lead to misdiagnosis or delays in treatment, increasing the chances of complications and death. Since TB remains a major infectious disease, there is an urgent need for targeted care and interventions for the elderly. This study explores the prevalence of TB, challenges in diagnosis, and barriers to treatment in older adults in Anambra State.
Intervention or response: A comprehensive review was conducted to identify key limitations in tuberculosis (TB) management among the elderly. This involved the collection and analysis of clinical data from October 2024 to February 2025. Data were gathered from health facility records, and analyzed to identify recurring gaps and challenges.



Results/Impact: Findings indicate that TB in older adults is often underdiagnosed due to overlapping symptoms with other chronic illnesses, leading to delayed or inadequate treatment.

Additionally, polypharmacy, drug interactions, and cognitive decline contribute to poor treatment adherence. Strengthening healthcare provider training and increasing public awareness further mitigate the growing burden of TB in this vulnerable population as shown in the chat below.

Conclusions: Addressing tuberculosis (TB) in the elderly requires a shift toward specialized care models that emphasize early detection, individualized treatment, and comprehensive patient management. The implementation of age-specific diagnostic protocols has significantly improved access to geriatric TB care, leading to earlier diagnoses, better treatment outcomes, and a reduction in mortality rates. Tackling TB among aging populations is not only a medical imperative but also a vital component of global TB control strategies.

EP43-1117-20 TB in older adults (GERIA-TB): Clinical characteristics and outcomes from a low-incidence country

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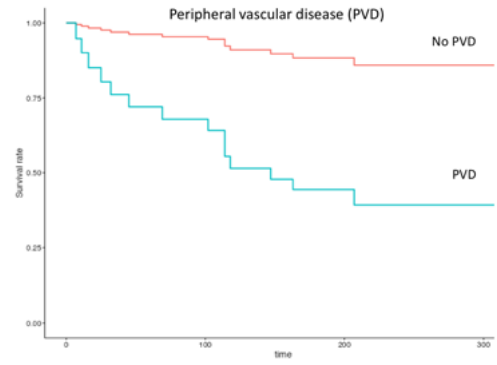
Background: Age is a risk factor for active TB and elderly persons with TB face delayed diagnosis, high rate of adverse events and poor outcomes. However, evidence in this group is scarce. Italy has low TB-incidence (4.4/100.000) and its population is ageing (24.7% ≥ 65 years-old). TB cases in Italy are mainly distributed in two groups: elderly Italian natives and young foreign-born persons from high-incidence countries.

Design/Methods: Retrospective, multicentre study enrolling persons ≥65-years-old diagnosed with TB (2019-2024). We collected data on baseline characteristics, clinical presentation, diagnosis and treatment. Age was classified in: 65-74 (young-old),75-84 (middle-old), ≥85 (old-old).

We considered two outcomes: drug-related adverse events (AE) and death during TB treatment. Cox regressions were used to identify outcome-associated variables.

Results: 81 patients were included (40.7% young-old, 38.3% middle-old, 21% old-old), most (84%) were Italian, males (59.3%) with pulmonary TB (65.4%). All cases were rifampin-sensitive. Median Charlson Comorbidity Index was 4 (IQR 4-6), median of 4 concomitant medications (4-7). 13.8% did not have a clinical suspicion of TB. Diagnosis was made with invasive methods (bronchoscopy, gastric aspirate) in 39/53 (73.6%) of pulmonary TB cases. Median time from symptom onset to TB diagnosis was 42 days (IQR 16-92).

30 patients (37%) experienced at least 1 AE, ≥ grade3 in 12 cases (14.8%). Hepatotoxicity was the most common AE (n=24/30, 80%). Median AE-driven treatment-days loss was 23(IQR 10-30). Pyrazinamide was the drug most frequently permanently interrupted due to AEs. No deaths due to AE were recorded, no variable was associated to AE development. Overall mortality was 21% (n=17), with peripheral vascular diseases and age associated to increased mortality (Figure).



aHR 10.32 (CI 95% 2.23-47.67), p=0.003

aHR: adjusted Hazard Ratio; CI, confidence interval; PVD, peripheral vascular disease

Figure. Adjusted survival curve for the variable peripheral vascular disease (PVD).
The following variables with p<0.1 were included in the multivariable Cox Regression model: age at diagnosis, baseline Chronic Obstructive Pulmonary Disease (COPD), baseline estimated glomerular filtration rate, Charlson Comorbidity Index, number of baseline concomitant medications.
Together with PVD, age at diagnosis was associated with increased mortality:
aHR 1.12 (CI 95% 1.01-1.24, p=0.029)

Conclusions: We confirm a high rate of adverse events and mortality in elderly persons with TB. Peripheral vascular disease is a major risk factor for death in our cohort. More evidence can be found expanding the study population.

EP44 Harnessing Innovation: AI, breathomics, and data science for the future of TB detection, prevention and care

EP44-1118-20 Breath analysis using HPPI-TOF-MS and spatial attention convolutional neural networks for latent TB infection screening: A diagnostic accuracy study

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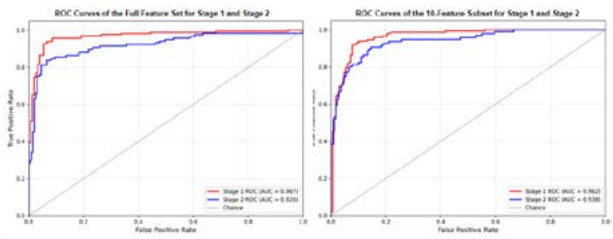
Background: Current screening methods for latent tuberculosis infection (LTBI), including Tuberculin Skin Test (TST) and Interferon-Gamma Release Assay (IGRA), have limitations such as low specificity, high cost, invasive procedures, and complex workflows.
Furthermore, positive LTBI screening requires additional testing to rule out active pulmonary tuberculosis (aPTB), potentially leading to loss-to-follow-up. Breath analysis emerges as a promising non-invasive tool for tuberculosis screening.
Design/Methods: We established a large-scale breath database (>10,000 samples) from patients visiting Shenzhen Third People's Hospital (2019-2024), utilizing High-Pressure Photon Ionization Time-of-Flight Mass Spectrometry (HPPI-TOF-MS). To address instrument drift and high-dimensional data challenges, we proposed a novel method combining global peak alignment and a two-stage convolutional neural network (CNN) with a spatial attention mechanism. In data preprocessing, global peak alignment corrected signal drift. The CNN model included Batch Normalization and Dropout layers to enhance stability and prevent overfitting. Stage one distinguished healthy individuals from LTBI; stage two differentiated LTBI from aPTB. Gradient-based feature selection via signal first derivatives and t-tests identified the top 10 discriminatory features to reduce dimensionality.
Results: We included 316 participants with LTBI, 682 aPTB patients, and 1090 healthy controls. 85% were used as training and 15% as validation. With full feature datasets, training accuracy reached 99.72% (stage 1) and 98.53% (stage 2), with validation accuracy of 91.72% and 87.58%, respectively. After gradient-based feature selection, training set accuracy improved to 99.89% for Stage 1 (sensitivity and specificity both 100%) and 100% for Stage 2 (sensitivity and specificity both 100%). Validation set accuracy after feature selection was 89.17% (sensitivity of 88%, specificity of 90%) in Stage 1, and 85.67% (sensitivity of 75%, specificity of 91%) in Stage 2.



Conclusions: The developed spatial attention CNN effectively addresses data drift, identifies key biomarkers, and accurately classifies TB stages, supporting breath-based LTBI screening. Future validation in community settings is needed to confirm practical applicability.

EP44-1119-20 Construction and preliminary validation of a breath-based diagnostic model for bacteriologically unconfirmed pulmonary TB using deep anomaly detection

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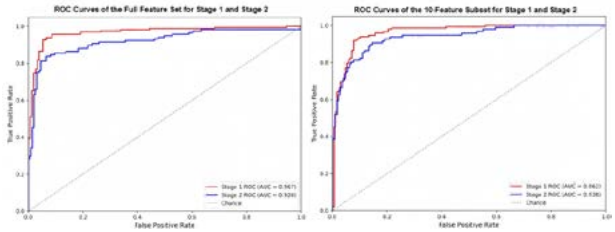
Background: Diagnosing bacteriologically unconfirmed pulmonary tuberculosis (PTB-U) remains a persistent challenge in clinical settings. Building on our previously developed breathomics-based diagnostic model for bacteriologically confirmed PTB (PTB+), we investigated its generalizability and diagnostic value in identifying PTB-U cases.
Design/Methods: We utilized a large-scale breathomics database (>10,000 samples) established at Shenzhen Third People's Hospital (2019–2024), with data acquired via High-Pressure Photon Ionization Time-of-Flight Mass Spectrometry (HPPI-TOF-MS). Breath spectra from 329 PTB+ patients and 185 patients with non-tuberculous pulmonary diseases were used to train a deep anomaly detection model. This model, based on Convolutional Neural Networks (CNN) integrated with channel and

spatial attention mechanisms, was trained exclusively on PTB+ data using the Deep Support Vector Data Description (Deep SVDD) framework, enhanced by dynamic thresholding and custom data augmentation.
Results: The model demonstrated excellent performance in 5-fold cross-validation, achieving up to 94.55% accuracy, 92.82% sensitivity, and 97.37% specificity in identifying PTB+ cases. When applied to an independent test set consisting of 183 PTB-U cases and 185 non-TB controls, the model achieved 85% sensitivity and 92% specificity, suggesting strong generalizability and shared breathomic features between PTB+ and PTB-U cases.



Conclusions: Our findings support the feasibility of breathomics-based anomaly detection models for identifying PTB-U, indicating potential biological similarity between PTB+ and PTB-U at the molecular signature level. Further validation through large-scale, multicenter studies is warranted to refine and implement this approach in clinical practice.

EP44-1120-20 Transforming TB treatment monitoring with breathomics: A prospective cohort study in drug-susceptible pulmonary TB

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Background: Current methods for monitoring tuberculosis (TB) treatment response rely primarily on sputum culture conversion, radiological changes, and fixed-duration regimens. There is a critical need for new biomarkers. We investigated the use of breathomics and machine learning to dynamically monitor treatment progression and identify individualized stopping points.

Design/Methods: We collected longitudinal breath samples from 100 patients with drug-susceptible pulmonary TB treated with standard HRZE regimen, and analyzed them using HPPI-TOF-MS. Firstly, a Transformer regression model was first trained in a weakly supervised manner, assigning a score of 0 to the first sample and 1 to the final sample, to derive a population-level recovery trajectory f(t) and estimate the earliest timepoints reaching various health score thresholds. Secondly and separately, an MLP classifier was trained to distinguish active TB (≤30 days) from favorable outcome status (FOS; ≥120 days or post-treatment). The classifier was applied to each patient's longitudinal data to determine the proportion reaching the strict FOS threshold (≥1.0) at different timepoints.
Results: The fitted f(t) curve derived from the Transformer model showed a consistent upward trend throughout treatment. Median stopping times for f(t) reaching 0.90, 0.95, and 1.00 were 149, 166, and 192 days, respectively (Figure 1). Separately, FOS similarity scores from the MLP classifier also increased over time. The mean transition time to a FOS-like state was 111.3 days (SD: 61.0), with a median of 62 days (IQR: 31–160). By day 60, 48.9% of patients reached the threshold; by day 90, 56.7%; by day 120, 64.4%; and by day 180, 78.9%.

Conclusions: Our dual-model framework, integrating breath-based Transformer and MLP models, enables non-invasive tracking of TB recovery and identifies patients likely to achieve favorable outcomes before 6 months. These findings support the potential of breathomics-guided tools for individualized treatment shortening, warranting prospective clinical validation in real-world settings.

EP44-1121-20 Streamlined 4-zone point-of-care ultrasound (POCUS) exam for pulmonary TB

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Background: Point-of-care ultrasound (POCUS) is a promising, radiation-free triage tool for tuberculosis (TB), but lacks standardized acquisition protocols. We applied machine learning to streamline the POCUS protocol in order to aid in discrimination of pulmonary TB from normal lungs and other respiratory conditions.
Design/Methods: In a prospective study in Uganda, we enrolled individuals aged ≥13 years, including TB index cases, household contacts, and symptomatic clinic evaluees diagnosed with non-TB respiratory conditions.
Participants had sputum GeneXpert Ultra ± TB culture and an 18-zone POCUS exam (12 lung, 6 FASH), performed and interpreted for pathologic findings by ultrasonographers blinded to TB status.
The 18-zone exam was simplified into anatomically-symmetric 2- to 8-zone protocols most predictive of TB status, using Random Forest classifiers trained on 70% of the dataset and tested on the remaining 30%.
Results:

Protocol	Zones	AUC ROC [95% CI] for TB detection	Sensitivity @ 70% Specificity (WHO target for Triage test = minimum 90% sensitivity, 70% specificity)
2-zone	R3_L3	0.68 [0.55 - 0.80]	Sens = 61% Spec= 70%
4-zone	R3_L3_L5_R5	0.82 [0.73 - 0.91]	Sens = 77% Spec= 70%
6-zone	R1_R2_L1_L2_L5_R5	0.79 [0.69 - 0.90]	Sens = 77% Spec= 70%
8-zone	R1_R4_L1_L4_L5_R5_FASH1_FASH6	0.80 [0.69 - 0.91]	Sens = 77% Spec= 70%
12-zone (lung)	R1_R2_R3_R4_L1_L2_L3_L4_L6_R6_L5_R5	0.81 [0.70 - 0.93]	Sens = 77% Spec= 70%
18-zone (Lung+FASH)	Lung + FASH zones	0.76 [0.64 - 0.87]	Sens = 71% Spec= 70%

Table 1. Performance of streamlined 2-, 4-, 6-, 8- zone versus comprehensive 12- and 18- zone POCUS exams.

Among 315 participants, 104 were sputum TB-positive (63% male; 2% cough only vs 98% with multiple TB symptoms); 211 were TB-negative, 102 of whom had a non-TB respiratory diagnosis, including 42 with other community-acquired pneumonia.
Simplified 4-, 6-, and 8-zone lung exams performed comparably to the full 12-zone (AUC=0.81) and 18-zone lung+FASH (AUC=0.76) protocols, with AUCs ranging from 0.79–0.82 (see Table 1). At the WHO triage test specificity threshold of 70%, the 4-zone protocol achieved ≥77% sensitivity. Key findings predictive of TB included lung consolidation, air bronchograms, and pleural irregularity.
Conclusions: A simplified 4-zone lung POCUS protocol detected TB with similar accuracy to an 18-zone exam, supporting its potential as a practical triage tool. Though performance in this manually-interpreted, modest-sized dataset did not reach WHO triage test targets, it shows promise with further model development. Results highlight the need for additional training and validation datasets, and ongoing development of a POCUS computed-aided diagnosis (CAD) tool to scale-up TB case findings.

EP44-1122-20 Prediction of TB risk in the elderly population of Eastern China: Development and validation of multiple machine learning models

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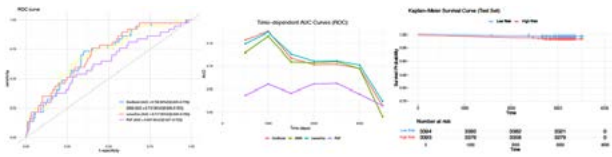
Background: Tuberculosis (TB) poses a significant public health challenge in China, particularly among older adults. This study aimed to develop and validate machine learning models to predict TB risk in the elderly using selected predictors.
Design/Methods: A cohort study of 33,935 participants aged ≥60 years was conducted in Eastern China from January to December 2016, with prospective follow-up to document TB incidence. Lasso regression identified key predictors, and models including CoxBoost, Generalized Boosted Models (GBM), LassoCox, and Random Survival Forests (RSF) were developed. A nomogram was constructed, and performance was assessed using AUC, Brier score, and C-index.
Results: Over a follow-up period exceeding 8 years, 387 participants developed TB (incidence rate: 134.5 per 100,000 person-years, 95% CI: 121.1, 147.9). Lasso regression identified critical predictors, including Drinking, sex, diet, BMI, and Motor function. Among the models, LassoCox demonstrated the highest discriminatory ability with an AUC of 0.717 (95%CI: 0.692–0.742), followed

by GBM (AUC: 0.712, 95% CI: 0.687–0.737), CoxBoost (AUC: 0.708, 95% CI: 0.683–0.733), and RSF (AUC: 0.637, 95% CI: 0.611–0.663). Calibration was reasonable, with Brier scores of 0.338 (95% CI: 0.321–0.355) for LassoCox, 0.346 (95% CI: 0.329–0.363) for RSF, 0.356 (95% CI: 0.339–0.373) for GBM, and 0.326 (95% CI: 0.309–0.343) for CoxBoost.
Time-dependent AUC curves further confirmed the models' predictive stability across the follow-up period. However, Kaplan-Meier survival curves for low- and high-risk groups exhibited limited separation, despite a statistically significant difference (log-rank P < 0.001).



Conclusions: This study successfully developed and validated multiple machine learning models to predict TB risk in the elderly of Eastern China. The LassoCox model showed moderate predictive accuracy for TB risk in the elderly. However, limited survival curve separation suggests the need for additional predictors, higher event rates, and advanced modeling to enhance risk stratification and clinical utility.

EP44-1123-20 Identification of large TB transmission clusters using machine learning models in Taiwan, Kaohsiung

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Background: Tuberculosis (TB) remains a global health challenge, with over 10.8 million new cases and 1.25 million deaths in 2023. Active case finding, particularly through targeted screening of high-risk populations, is crucial for TB control, especially in low-incidence countries striving for elimination. This study aims to explore factors driving TB transmission cluster growth by analyzing Whole Genome Sequencing (WGS) data from Kaohsiung, Taiwan (2019-2023).
By investigating individual and cluster-level characteristics, we aim to identify early predictive features that can improve outbreak prevention and optimize resource use for more effective TB control.
Design/Methods: This study uses data from the Kaohsiung Department of Health, including culture-confirmed TB cases from 2019 to 2023. Clusters are defined by a SNP distance less than 12, with the outcome being the development of transmission clusters with more than 5 individuals. Various machine learning models are employed to identify genetic and epidemiological factors that predict TB transmission and outbreaks.
Results: In this study, we analyze data from 4168 patients, with 1200 in transmission clusters. Clusters with a size ≥5 include 512 patients, while clusters with a size <5 include 688 patients. Using a random forest model in the preliminary analysis, we found several key predictors of large TB transmission clusters: lineage, age, the proximity of reporting date between cases, and geographic proximity. These factors show good predictive value for identifying TB transmission clusters.
Conclusions: This study examines factors that drive TB transmission cluster growth in Taiwan. We will employ various models and quantification methods to identify the most effective prediction approach, ultimately enhancing proactive interventions and public health strategies for TB prevention.

EP44-1124-20 Predicting loss to follow-up among people with TB in Karamoja, Northern Uganda: A machine learning approach

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Background: Loss to follow-up (LTFU) while on TB treatment is a key programmatic outcome that may lead to further adverse effects of TB e.g., treatment failure or development of drug resistance. Early identification of individuals at risk of loss to follow-up could enable timely and focused interventions to improve retention and overall program performance. Using machine learning, we developed a predictive model to identify patients most likely to experience loss to follow-up in the Karamoja subregion, north-eastern Uganda.
Design/Methods: We conducted a retrospective study using routinely collected TB treatment data from health facilities in the Karamoja subregion for the period 2019-2022. We defined loss to follow-up as missing eight or more consecutive months of TB treatment. We extracted

data on sociodemographic, clinical, and laboratory variables. We developed a predictive model for LTFU using multiple machine learning algorithms including random forest, light gradient boosting, and decision tree classifier. We split the dataset into training and test sets (80/20) and assessed model performance using the area under the receiver operating curve (AUROC), F1Score, and Cohen Kappa. Feature importance was evaluated to identify key predictors.
Results: Our dataset had 9816 patients, and 13.07% were lost to follow-up. The light gradient boosting model was the best-performing model with an AUROC equal to 0.96, an F1 core of 0.9, and a Cohen Kappa of 0.8. The most significant predictors of loss to follow-up were age>60years, HIV- status, distance > 5 KM from the health facility, referral to another healthy facility during TB treatment, patient belonging to a high-risk group, patient having been previously treated for TB, patient type, PBC disease classification category.
Conclusions: Machine learning models can effectively identify TB patients at risk of loss to follow-up in resource-limited settings, offering an opportunity for targeted support and interventions for those most at risk.

EP44-1125-20 Predicting TB culture contamination using machine learning: The role of sputum transit time and clinical features

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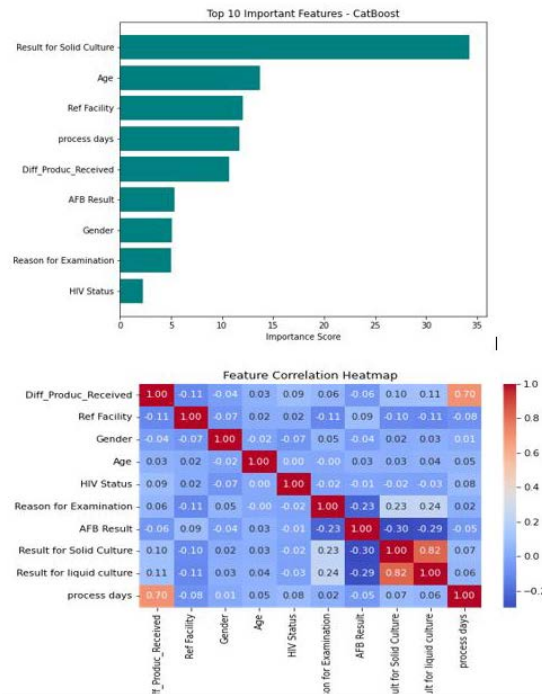
Background: Tuberculosis (TB) culture contamination poses a significant challenge to the timely and accurate diagnosis of TB, particularly in high-burden settings where delays in sample transport and inconsistent laboratory workflows can compromise diagnostic quality.
This study investigates the potential of machine learning (ML) models to predict contamination in Mycobacterium tuberculosis liquid cultures, with a focus on the impact of sputum transit time and related clinical variables.
Design/Methods: Using a dataset comprising routine clinical and laboratory records, a retrospective observational approach was used to evaluate the influence of factors such as sputum transit time, HIV status, AFB smear results, and referring facility on TB culture outcomes. Twelve classification algorithms were tested for predictive performance. Models were assessed using accuracy, F1 score, precision, recall, and ROC AUC metrics.
Results: Logistic Regression, CatBoost, ExtraTrees, and RandomForest classifiers achieved the highest performance, each reaching an accuracy of up to 93.9% and strong ROC AUC scores (up to 0.94). Feature's analysis confirmed that sputum transit time was a key predictor of contamination, alongside AFB results and HIV status.



Conclusions: This study demonstrates the utility of machine learning in enhancing TB diagnostic workflows by accurately identifying specimens at high risk of culture contamination. Integrating such predictive tools into laboratory systems could support targeted interventions, reduce diagnostic delays, and improve the overall quality of TB culture-based testing.

EP44-1126-20 Data visualisation using Microreact dashboards to connect next-generation sequencing analysis, comprehensive test result data and demographics of people with M. tuberculosis in New York state

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Background: Visualization of next-generation sequencing (NGS) data in combination with other clinical test data and patient demographics is often challenging especially for the comprehensive information available for a

Mycobacterium tuberculosis complex (MTBC) case. NGS data are not typically integrated into laboratory information management systems (LIMS) and clinical LIMS often lack the capabilities for visualizations to track trends in real time.

Design/Methods: We have performed clinical whole-genome sequencing (WGS) and targeted NGS (tNGS) on > 6000 MTBC-positive patients with bioinformatic analysis which confirms mycobacterial species, typing (e.g., MTBC lineage and spoligotype), and identifies predictors of antimicrobial resistance (AR; i.e., mutations). The pipelines are run weekly on all MTBC isolates and respiratory specimens that undergo WGS and tNGS. This dashboard creation for MTBC utilizes Data-flo and Microreact software beneath our firewall.

Results: These Microreact dashboards provide user-friendly interactive views of real-time trends in data outputs. The software tools transform, summarize, and visualize the data to enhance data exploration and streamline interpretation. We have web views that allows for visualization over time. We also use mapping by MTBC species, lineage, spoligotype, AR mutation, specimen type and other patient demographic and laboratory testing data.

Conclusions: Visualization of outputs of NGS pipelines in combination with existing data from systems such as LIMS with Microreact dashboards is providing an efficient way to summarize and view that data in real-time. Collaboration with our LIMS and Information Technology (IT) teams, bioinformaticians, and epidemiology partners demonstrates a path forward for comprehensive integration of NGS data into public health workflows.

We strive to expand the utilization of NGS data through providing informative dashboards that can be shared regularly with partners and monitored for trends that may be missed and ultimately hope to demonstrate clinical and public health impact.

EP45 Innovating multi-sectoral engagement to improve TB care

EP45-1127-20 Association between geographic accessibility and use of the private sector among people with TB in Lima, Peru

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Background: In Peru, the private sector diagnoses TB but does not deliver TB treatment, and there are no formal referral systems between sectors. We sought to understand why people with TB seek care first in the private sector and whether doing so delays TB treatment.

Design/Methods: We administered questionnaires asking people with TB about their access to health services, including comparative opinions of services in the public and private sector. We calculated relative risk for the association between each opinion and initial care-seeking in the private sector, and used t-tests to assess whether care-seeking in the private sector was associated with delayed treatment. We included people ≥15 years old in their first month of TB treatment from a stratified random sample of 30 health facilities in Lima during 2024-2025.

Results: Of 388 participants, 38% first sought care in the private sector. Participants reported a median of 4 (IQR 3-6) visits before TB diagnosis and a median of 49 days (IQR 27-100) between symptom onset and treatment initiation. While average visits and days until treatment were greater for people who went first to the private sector, differences were not significant (p=0.236, p=0.186, respectively). The most prevalent opinions were that the private sector offers faster attention and more convenient hours, the public sector offers better geographic accessibility and affordability, and the two offer equivalent respectfulness and quality of care (Table).

Surveyed opinions comparing the private and public sectors with regard to accessing TB services and association with initial care-seeking in private sector (N=388)	Public sector is better, n (%)	Private sector is better, n (%)	Two sectors are equivalent, n (%)	Association between believing private sector is better and initial care-seeking in private sector, relative risk (95% CI)
Speed of attention	47 (12)	239 (62)	102 (26)	1.04 (0.80-1.34)
Convenience of hours	62 (16)	181 (47)	145 (37)	1.10 (0.85-1.41)
Geographic accessibility	277 (71)	44 (11)	67 (17)	1.65 (1.24-2.20)
Affordability	382 (98)	1 (1)	5 (1)	Undefined
Respectful treatment	63 (16)	64 (16)	261 (67)	0.97 (0.69-1.37)
Quality of service	60 (15)	126 (32)	202 (52)	0.79 (0.59-1.01)

The only opinion associated with seeking care first in the private sector was that the private sector was more geographically accessible (relative risk 1.65, 95% CI 1.24-2.20).

Conclusions: Many people with TB seek care first in the private sector, possibly when private clinics are more conveniently located. However, this choice is not associated with significant delays in treatment. Public-private partnerships prioritizing private clinics serving communities far from public services could help further reduce time to treatment.

EP45-1128-20 Barriers and best practices in TB treatment initiation across public and private providers in Indonesia: A multi-stakeholder qualitative study

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Background: Timely diagnosis and treatment initiation are critical to controlling tuberculosis (TB), yet significant delays persist in Indonesia. Fragmented service delivery, limited patient awareness, and gaps in referral systems contribute to treatment interruption and poor outcomes. This study aimed to explore the barriers and facilitators to TB treatment initiation across different healthcare settings and stakeholders in Indonesia to inform patient-centered and system-level improvements.

Design/Methods: A qualitative study was conducted across six sites in Indonesia: Pontianak (West Kalimantan), Manado (North Sulawesi), Mataram (West Nusa Tenggara), Bogor (West Java), Serang (Banten) and Pringsewu (Lampung). Data were collected through in-depth interviews and focus group discussions with TB patients, health cadres, and healthcare providers in both public and private facilities. Thematic analysis was performed and triangulated with findings from a national TB referral system survey.

Results: Barriers to treatment initiation included limited TB literacy, stigma, fear of medication side effects, economic hardship, reliance on traditional medicine, and geographical inaccessibility. Health cadres highlighted issues such as patient denial, time constraints, and mistrust of healthcare providers. Systemic and provider-level barriers included fragmented referral pathways, poor coordination between facilities, staff shortages, stockouts, and limited engagement of private sector providers. However, promising practices—such as peer support, visual counseling using X-rays, treatment incentives, and community-based follow-up—helped improve treatment uptake and adherence.

Conclusions: This study identifies critical multi-level barriers and locally grounded best practices for TB treatment initiation in Indonesia. Strengthening referral coordination, engaging private providers, and reducing stigma through patient-centered and community-driven approaches are essential to accelerate progress toward TB elimination.

EP45-1129-20 Enhancing TB care in private sector in India: Role of innovative private sector engagement model under programmatic settings

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Background: India's private sector plays a crucial role in the country's tuberculosis (TB) healthcare landscape, with 50% of patients seeking care from private providers. Recognizing this critical role, National Tuberculosis Elimination Program (NTEP) scaled up an innovative private sector engagement model of Patient Provider Support Agency (PPSA) in over 200 districts of country in 2023 to improve TB care in private sector.

Design/Methods: A cross- sectional study was conducted to assess the role of PPSA in improving TB care services among private-sector patients during 2023. We compared district with PPSA and without PPSA for their TB notification, care services and treatment outcomes from private sector at India level. Data for private sector notification from *Ni-kshay* (TB health management information system) was analyzed.

Results: In 2023, districts supported by PPSA (n=204) recorded an average private sector TB notification rate of 106 per 0.1 million and achieved 99.7% of the set target, compared to 530 districts without PPSA, which reported notification rate of 45 per 0.1 million and reached only 80% of the target nationwide.

There was lower pretreatment loss to follow up (LFU) of 2% vs 4% and treatment initiation delay for >7 days (5% vs 10%) in districts with PPSA. They also had improved TB care cascade services- HIV & diabetes testing, bank

detail linkage with *Ni-kshay* for accessing nutrition incentives and treatment success with PPSA support (Figure1). While coverage for rifampicin susceptibility testing, upfront nucleic acid amplification test and uptake of government drugs was lower in PPSA districts compared to non-PPSA districts.

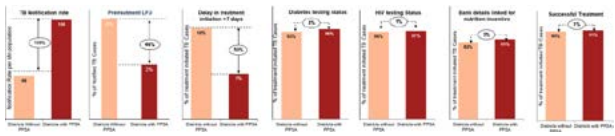

Figure 1. Comparison of private sector TB notification, care cascade services and treatment outcome in districts with and without PPSA during Jan-Dec 2023, India.

Conclusions: The innovative PPSA model demonstrated significant impact in enhancing private-sector TB care in India, achieving higher notification rates, reduced pretreatment LFU, and improved treatment initiation and success rates. Its comprehensive approach to care cascade services underscores its potential for scalability and effectiveness in achieving national TB elimination targets.

EP45-1130-20 Leveraging corporate social responsibility to enhance molecular diagnosis of TB in Uttar Pradesh

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Background and challenges to implementation: A persistent gap in the TB care cascade in Uttar Pradesh, India, is the limited access to WHO-recommended rapid molecular diagnostics (mWRD) for bacteriological confirmation of those diagnosed with active TB. The availability of mWRD is low, particularly within 79 blocks in 8 aspirational districts in UP. Aspirational districts are high-focus areas with poor socio-economic and health indicators, requiring focused attention for TB elimination due to limited infrastructure and higher disease burden.
Intervention or response: In 2023, the Central TB Division and State TB Cell leveraged 61 Truenat machines (Molbio®) from the Indian Oil Corporation Limited (IOCL) under their Corporate Social Responsibility (CSR). 43 of 61 machines were deployed within blocks of 8 aspirational districts, thus increasing availability of machines from 54% to 90%. To optimize utilization state-deployed human resources, India Health Action Trust implemented Diagnostic Network Optimization supported by the Gates Foundation with monitoring for assessment of utilization against capacity and advocacy to ensure a regular supply of test kits and consumables from the State TB Cell.
Results/Impact: Following the deployment of IOCL's Truenat machines, the proportion of microbiologically confirmed TB cases using mWRD in the eight aspirational districts significantly increased from 50% in 2023 to 77% in 2024 and further to 83% in the initial months of 2025. Test utilization against available capacity surged from 40% (8,569 tests conducted out of a 21,500 test capacity in Jan–Feb 2024) to 180% (38,787 tests conducted in the same period of 2025).
This sharp increase was particularly notable during the 100-day Intensified TB Campaign, highlighting the substantial impact of CSR on expanding diagnostic reach in resource-limited settings.
Conclusions: Meaningful partnerships with CSR of large industries can leverage TB diagnostics and contribute to improving availability and utilization of mWRD for bacteriological confirmation of diagnosed active TB.

EP45-1131-20 Is private sector challenging to engage on addressing TB? Situation analysis in Bangladesh

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Background and challenges to implementation: In Bangladesh, nearly 84% of people seek initial care from private healthcare providers, yet these providers contribute only 24% of TB case notifications and 22% of estimated incidence. This underrepresentation reflects critical gaps in collaboration, standardization, and mandatory notification. While the 2014 TB notification policy exists, 37% of private providers remain unaware. Fragmentation, limited diagnostic capacity, and lack of incentives have further hindered systematic engagement.
Intervention or response: To address these challenges, the National Tuberculosis Control Programme (NTP), with partners like BRAC and icddr,b, implemented a comprehensive Public-Private Mix (PPM) model. Interventions included engaging 25,000 Graduate Private Providers (GPPs) and 50,000 Non-Graduate Providers (NGPPs), establishing DOTS corners in 71 hospitals, and launching digital tools such as the JANAO App and eTB Manager for real-time notification and treatment tracking. Diagnostic centers and mobile screening units were deployed in urban hotspots, factories, and workplaces. The PPM Strategic Plan 2023–2026 targets increasing private sector referral contribution from 25% in 2021 to 35% by 2026, improving diagnostic quality, and introducing strategic purchasing and social contracting to sustain engagement. NTP also has a MAF (Multisectoral Account-

ability Framework) strategy for effective engagement of all stakeholders to address TB leveraging domestic resources along with foreign aids and guidance.
Results/Impact: Referrals from GPPs (18%) and private hospitals (4%) have contributed to improved detection. Despite limited incentives, private participation helped maintain a 95% treatment success rate. However, diagnostic quality issues and inconsistent reporting remain prevalent. Increased digital integration and targeted training are beginning to address these challenges.
Conclusions: While the private sector is pivotal in TB care, sustained engagement remains complex due to systemic, operational, and financial barriers. Strengthening governance, incentivizing notification, and integrating digital tools can unlock the sector's potential—supporting Bangladesh's goal to reduce TB incidence from 221 to 135 per 100,000 by 2030.

EP45-1132-20 Disparities in drug-resistant TB detection: A comparative analysis of private healthcare settings and community-based case finding in Katsina State, Nigeria

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Background: Nigeria has made significant progress in TB treatment coverage in the past 5-years, primarily due to the scale up of community and private sector involvement in TB control. It has however been noted that the identification of DRTB cases remains disproportionately higher from private healthcare settings compared to the community. This raises concerns about the effectiveness of current community strategies in detecting DRTB. The study aimed to compare DRTB detection rates between PPM and community approaches and evaluate the use of GeneXpert diagnostics across both settings in Katsina State, Nigeria.
Design/Methods: A retrospective cross-sectional analysis was conducted using programmatic data from January to December 2024. TB notification data and laboratory reports were reviewed across all private facilities and community campaigns in Katsina. Key variables included the number of TB diagnosed, proportion tested with GeneXpert, and numbers of confirmed DRTB cases. Descriptive statistics summarized trends, while Chi-square tests assessed differences in proportions between settings, with statistical significance set at $p<0.05$.
Results: A total of 15,648 TB cases were diagnosed during the study period; 5,612 (35.9%) through private and 10,036 (64.1%) through community outreaches. Among these, 106 DRTB cases were detected. The DRTB detection rate was significantly higher in private settings: 1.3% versus 0.3% in ACF ($p < 0.001$). GeneXpert was used for 87% of TB cases in private settings compared to 63% in community settings, also statistically significant ($p <0.001$). This indicates that although community case finding contributed a greater share of overall TB case detection, its yield for DRTB remained low, likely due to reduced access to molecular diagnostics.
Conclusions: The study demonstrates a significant disparity in DRTB detection between privateand community-based settings in Katsina state, with private facilities showing higher diagnostic coverage and better utilization of GeneXpert technology. This highlights the need to scale up molecular testing capacity for community intervention.

EP45-1133-20 Institutionalising multi-ministerial accountability for TB prevention adn care: High-level advocacy and subnational monitoring to enhance commitment, TB funding and detection in Indonesia

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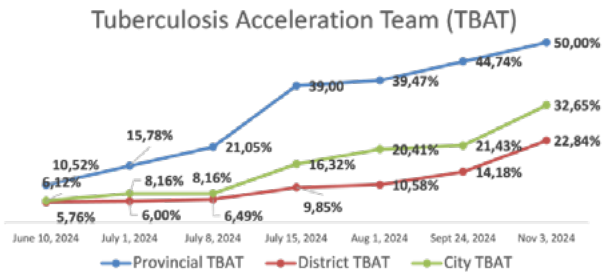
Background and challenges to implementation: Indonesia has the world's second-highest tuberculosis (TB) burden (GTB, 2024). Despite committing to reduce TB incidence by 65 per 100,000 population and eliminate the disease by 2030, a $494 million funding deficit persists (NSP, 2024). While the 2021 Presidential Decree on Tuberculosis mandates multi-sectoral collaboration at national and subnational levels, TB remains deprioritized across ministries and stakeholders, hindering progress toward elimination targets.
Intervention or response: In 2024, Indonesia's Ministry of Health, in collaboration with the Coordinating Ministry for Human Development and Cultural Affairs and the Ministry of Internal Affairs, launched a structured virtual monitoring system to strengthen subnational tuberculosis (TB) program governance.
The initiative implemented a two-tiered accountability framework:
1. Ministerial-level reviews with governors and mayors, and;
2. Deputy Minister-level technical meetings with provincial and district health offices.

Key performance indicators—TB case notification, treatment enrollment, contact investigation coverage, and district acceleration team establishment—were tracked monthly. To institutionalize action, the Ministry of Internal Affairs mandated district-level TB acceleration teams and action plans via ministerial decree. Data collection was supported by the NTP and Stop TB Partnership Indonesia.

Results/Impact: By December 2024, 127 districts across 19 provinces established tuberculosis (TB) acceleration teams, reflecting a 3.2-fold increase from June 2024 (30 districts). This expansion enhanced multi-stakeholder collaboration and governance for district-level TB programs.

Concurrently, a landmark financial commitment of IDR 8 trillion (~USD 500 million) was announced by Indonesia's newly elected President in January 2025, signaling high-level prioritization of national TB elimination efforts.



Conclusions: Indonesia's multi-ministerial accountability framework catalyzed district-level TB program governance, evidenced by a 3.2-fold surge in acceleration teams (30 to 127 districts) and a landmark USD 500 million presidential funding commitment. This model demonstrates that structured subnational monitoring and high-level advocacy bridge funding gaps, align priorities, and accelerate progress toward national TB elimination targets.

EP45-1134-20 Accelerating TB elimination in Uganda: A multisectoral accountability framework approach

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Background and challenges to implementation: Uganda faces a significant burden of tuberculosis (TB) due to socioeconomic factors and limited access to healthcare. It ranks among the 30 high-burden TB-HIV countries. To achieve TB elimination by 2030, a multisectoral approach is necessary, addressing financial constraints, geographical barriers, low health literacy, and a limited understanding of TB signs and symptoms.

Intervention or response: Uganda adopted the WHO's MAF-TB to tackle these challenges in controlling TB. The National TB and Leprosy Programme (NTLP) collaborated with the Office of the Prime Minister (OPM) to integrate TB prevention and control into various sectors, thereby fostering a cohesive national strategy. OPM established structures, including policy coordination and implementation committees, to facilitate effective collaboration among Ministries, Departments, and Agencies (MDAs).

Through collaboration with the WHO, Global Fund, and USAID, NTLP provided technical support and resources for capacity building across multiple sectors, including promoting TB awareness and implementing screening initiatives in workplaces.

Results/Impact: The Prime Minister became a Tuberculosis Champion and promoted the implementation of MAF-TB, which led to increased funding and resource allocation within MDAs. 13 MDAs have integrated tuberculosis into their PIAPs and budgets and allocated over UGX 1.8 billion to support workplace tuberculosis screening, treatment linkage, transport, and nutritional support for TB patients. Ministry of Health expanded tuberculosis services closer to the public through workplace

and community screening and testing. 17,357 individuals were screened at 29 workplaces using mobile clinic outreach, and 192 were identified as positive for Tuberculosis.

An integrated national policy on HIV and TB in the workplace has been developed. 7 MDAs incorporated tuberculosis into their HIV workplace policies.

Conclusions: MAF-TB initiative showcases the effectiveness of multisectoral collaboration in addressing tuberculosis. It underscores the need to integrate TB control within broader societal frameworks and address health determinants. Political commitment and dedicated leadership are crucial in mobilising resources and overcoming challenges.

EP45-1135-20 Accelerating Uganda's fight achieving UNHLM targets to end

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Background and challenges to implementation: Uganda demonstrated its commitment to tuberculosis (TB) elimination by reaffirming global targets at the 2nd UN High-Level Meeting (UNHLM) on TB in 2023. Despite prioritizing equitable access to prevention, diagnosis, treatment, and social protection services, systemic barriers persist. These include limited funding, uneven access to diagnostics, workforce shortages, low notification rates for pediatric and drug-resistant TB (DR-TB) cases, stigma, and inadequate social protection. Such challenges slow progress by impacting timely diagnosis, adherence, and overall service delivery.

Intervention or response: To accelerate progress, Uganda implemented a multi-sectoral strategy targeting systemic gaps. Key interventions involved scaling domestic and donor funding, integrating TB screening into community health campaigns through initiatives like CAST+, and expanding rapid diagnostic tools such as GeneXpert in high-burden areas.

Comprehensive social protection packages were provided to enhance adherence and reduce financial burdens on TB patients. Innovative tools—including mobile diagnostic units, digital health platforms, and community health worker networks—extended services to underserved regions. Regular monitoring of key performance indicators (KPIs) informed adjustments and guided decision-making to optimize outcomes.

Results/Impact: Uganda made notable strides toward achieving UNHLM TB targets. TPT coverage exceeded expectations, reaching 539% for contacts over 5 years and 239% for children under 5 years in 2023, with similarly high results in 2024. Notifications rose to 86,498 cases in 2023 (89.9% of the target) and 82% of the 2024 target. DR-TB notifications improved to 78.8% (2023) and 71.5% (2024). However, challenges persist, particularly in pediatric TB notifications, which achieved only 51% of the 2024 target.

Indicator	Target 2023	Achievement (%) 2023	Target 2024	Achievement (%) 2024	Target 2025	Target 2026	Target 2027	Total 2023–2027	Cummulative Performance, 2 Years
Notification - All TB	96,265	89.9	107,767	82	98,971	95,000	87,000	475,236	175,365
TB children (<15 years)	15,925	74.8	19,841	51	14,654	14,000	12,000	72,409	22,037
Notification DR-TB	839	78.8	1,119	71.5	1,233	1,566	1,369	5,948	1,461
TB-TPT. Number of TB contacts, >5 years started on TPT	36,978	539	46,374	469	50,390	58,308	60,879	252,930	417,014
TB-TPT. Number of TB contacts, <5 years started on TPT	20,348	239	26,277	193	26,393	29,805	30,374	133,196	99,380
TPT PLHIV	105,724	105.2	134,044	78	139,452	142,622	145,257	667,099	215,774

Table. Tabulated data for UNHLM Targets 2023–2027 and 2024 Performance.

Conclusions: Uganda's multi-sectoral strategy has significantly advanced its fight against TB, offering a replicable model for TB-endemic countries. Sustained investments, diagnostic expansion, and community-centered interventions remain essential to achieving End TB targets by 2027 and bridging remaining gaps in TB prevention and care or ending TB.

EP45-1136-20 Bridging the gap in drug-sensitive TB treatment initiation in Indonesia: Insights from a national assessment and pathways for public-private collaboration

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Background: Indonesia remains a high-burden tuberculosis (TB) country, with an estimated 385 cases per 100,000 population in 2023. Despite progress in case notification (77% of estimated cases), treatment enrollment gaps persist, particularly for drug-sensitive TB (DS-TB), with enrollment rates declining from 90.8% (2021) to 88.3% (2023). Disparities exist across healthcare facilities, with private clinics (72–82%) and practitioners (76–82%) underperforming compared to public centers.
This assessment aimed to identify factors to DS-TB treatment initiation and propose actionable solutions.
Design/Methods: This assessment is a national level TB Information System (SITB) data analysis that including 1.195.174 people with DS-TB notified in 2023–2024. the association of subject characteristics, diagnostic procedures, comorbidity status and type of health facility with treatment initiation were analysed using cross tabulation and logistic regression.
Secondary data from the 2023–2024 TB Inventory Study (IVS) were incorporated to evaluate under-reporting factors influencing enrollment.
Results: Key findings revealed lower enrollment among elderly (84.4% for ≥60 years vs. 93.7% for <15 years) and males (87.7% vs. females' 89.1%). Standardized diagnostics (92.9% enrollment) and chest X-ray utilization (92%) improved enrollment rates, while delayed molecular test results (>3 days) reduced enrollment by 10–12%.
Private clinics and practitioners faced systemic challenges, including referral inefficiencies, financial barriers under national insurance (JKN), and under-reporting (77.2% unreported cases in private practices). The IVS identified 15.6% national under-reporting, skewing enrollment rates.
Logistic regression confirmed higher enrollment in facilities integrating comorbidities screening (DM with AOR:21.3; 95%CI:20.3-22.2 and HIV with AOR: 20.6; 95%CI:19.7-21.6), public health centers (AOR:2.14; 95%CI:2.05-2.24).
Conclusions: Strengthening referral systems, standardizing diagnostics, and enhancing private-sector engagement through policy mandates (e.g., MoUs, JKN incentives) are vital. Addressing socio-economic barriers, improving data synchronization, and expanding patient-centered care are recommended. Prioritizing these interventions will bridge enrollment gaps, align with Indonesia's TB elimination targets, and serve as a model for high-burden settings globally.

ABSTRACT PRESENTATIONS FRIDAY 21 NOVEMBER 2025

ORAL ABSTRACT SESSION (OA)

OA25 Enhancing TB detection and diagnostics in public and private settings

OA25-337-21 Acceptability and feasibility of an AI-powered care co-ordination tool in TB management in Patient Provide Supporter Agency (PPSA) service implementation model in India: Qualitative insights

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Background and challenges to implementation: The Network of Maharashtra People with HIV (NMP+) functions as a Patient Provider Support Agency (PPSA) service implementation model under India's National TB Elimination Program (NTEP), supporting Tuberculosis (TB) detection by operationalizing specimen transport, laboratory coordination, and longitudinal follow-up across private healthcare providers.
Intervention or response: An Artificial Intelligence (AI)-enabled digital platform (qTrack) was deployed across ten private healthcare facilities in Pune, India, to support TB surveillance and streamline care coordination. The platform facilitated real-time tracking of TB presumptive patients, sputum collection status, automated alerts for timely follow-up, and intra-facility report sharing.
A mixed-methods qualitative study was purposively conducted among 10 regular users (9 NMP+ field staff and 1 project officer) of the platform. In-depth, semi-structured questionnaires with open-ended questions were used to assess the acceptability and feasibility of the platform.
The responses were then analyzed using Visual Anthropac 4.9 to identify key themes, categories, and salience scores (an indicator of frequency and cognitive importance of a participant response) regarding barriers and facilitators in TB workflow integration.
Results/Impact: Thematic analysis of open-ended responses confirmed the platform's utility in patient tracking and data collation, with high frequency (70–80%) and salience score (0.5–0.8), well above the relevance threshold of 0.087. 90% participants suggested that the real-time notification feature is highly useful to track TB presumptive patients. Participants also noted that the AI tool enabled a real-time surveillance system, enhancing sputum collection tracking through immediate access to patient data.
Additionally, 70% found data management easier, 60% reported improved care coordination, 60% reported simplified patient tracking, and 30% noted a reduction in errors. Satisfaction with AI training and usability was uniformly positive.

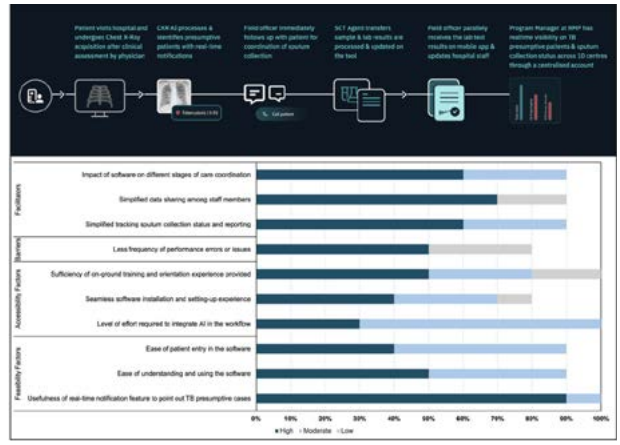

Figure 1. The clinical workflow is represented along with the quantitative representation of the survey results on acceptability, feasibility, barriers and facilitators.

Conclusions: AI-enabled tools strengthen TB surveillance and patient management by optimizing existing workflows, improving real-time care coordination, and operational efficiency across PPSA agencies and the NTEP, without requiring additional infrastructure investments.

OA25-338-21 Utility of symptom-agnostic chest X-ray for facility-based TB screening in Viet Nam: Secondary analysis of a large-scale public-private mix intervention

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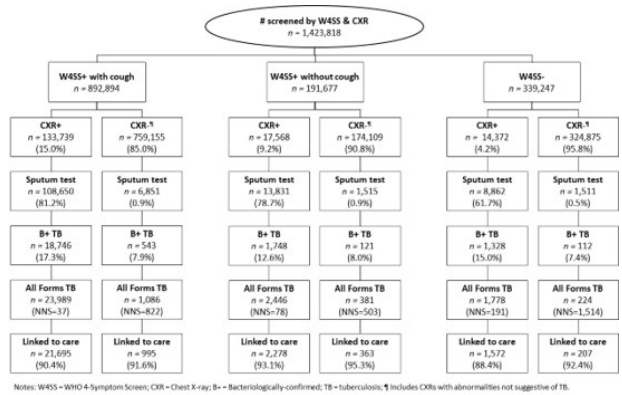
Background: Many people with tuberculosis (TB) report no symptoms and are only detected by chest X-ray (CXR). Since 2020, Viet Nam's guidelines recommend the 'Double-X' algorithm using CXR screening irrespective of symptoms followed by Xpert testing. Few studies have documented verbal and CXR screening for TB at health facilities at a representative scale, both in Viet Nam and globally.

Design/Methods: This was a secondary analysis of case-level data from health-seeking adults at 796 public and private healthcare providers in 15 provinces of Viet Nam in 2020-2023. The dataset encompassed demographic and clinical covariates; WHO 4-symptom screen (W4SS), CXR and sputum test results; and treatment linkage.

Data were analyzed using TB care cascades disaggregated by positive W4SS screens (W4SS+) with cough, W4SS+ without cough and asymptomatic presentation, and by CXR result. Bacteriologic-confirmation was the primary endpoint.

Primary outcomes included yield, number needed to screen (NNS), positivity and proportion of all bacteriologically-confirmed TB in the sample missed by CXR versus W4SS.

Results: Screening 1,423,818 individuals resulted in detecting 22,598 persons with bacteriologically-confirmed TB. Disaggregated by cohort, the yield was 2.2% (19,289/892,894; NNS=46) among persons with W4SS+ with cough, 1.0% (1,869/191,677; NNS=103) among persons with W4SS+ without cough and 0.4% (1,440/339,247; NNS=236) among asymptomatic persons. TB positivity in persons with abnormal CXR was between 4.6-9.4 percentage points higher than with a normal CXR result, so that relying on W4SS only would have required 5.4-6.5x more diagnostic tests. CXR missed 776 (3.4%) of symptomatic persons with bacteriologically-confirmed TB compared to W4SS missing 1,440 (6.4%) persons with asymptomatic TB.



Conclusions: Chest radiography can enable detection of asymptomatic TB, improving pre-test probability, and reducing testing of symptomatic individuals for TB.

OA25-339-21 Impact of private sector involvement in TB case finding: Results from 16 newly-included states in Nigeria

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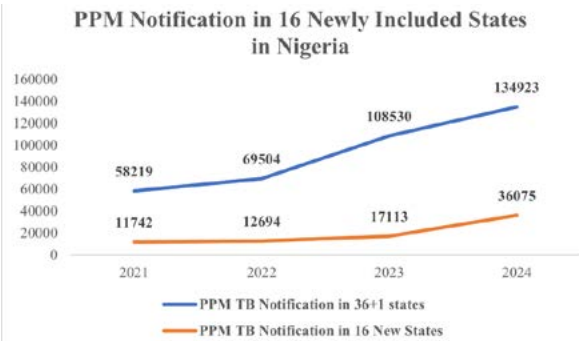
Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Nigeria, with a significant number of cases going undiagnosed. Although the private sector serves as the initial point of care for many individuals, its contribution to TB case detection has historically been underutilized. The Global Fund (GF), through the Institute of Human Virology Nigeria (IHVN), initially supported private provider engagement in 21 states. In 2024, this initiative was expanded to the remaining 16 states, achieving full nationwide private sector coverage.

Intervention or response: The engagement strategy targeted diverse private sector providers, including private health facilities, community pharmacies, patent medicine

vendors, traditional birth attendants/healers, and laboratories. A comprehensive approach was adopted, beginning with facility assessments and mapping using a hub-and-spoke model to ensure effective referrals and reduce cascade leakages. Providers received training on TB and HIV service delivery, including the use of the Mobile Application for Tuberculosis Screening (MATS) to support accurate identification of presumptive TB cases. Continuous supervision and mentorship were provided, and performance-based incentives were introduced to boost provider motivation and improve service delivery.

Results/Impact: By the end of 2024, data from the 16 newly engaged states showed a substantial improvement in TB case notifications, with 36,075 new cases reported from the private sector. This represents a 111% increase compared to 2023 and a 184% increase over 2022 levels, giving rise to the total national PPM notification from 108,530 in 2023 to 134,923 TB cases in 2024.



Conclusions: The expansion of private sector engagement to 16 additional states in 2024 significantly improved TB case detection, addressing a major gap in Nigeria's TB response. The results highlight the effectiveness of a structured, incentivized, and tech-enabled approach in mobilizing private providers. Sustaining and scaling this model can enhance early diagnosis, improve linkage to care, and contribute meaningfully to national TB elimination goals.

OA25-340-21 Strengthening public-private mix (PPM) for TB case finding: Expanding the role of private healthcare providers in Nigeria

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Background and challenges to implementation: Nigeria has a high TB burden, with an estimated incidence rate of 219 cases per 100,000 people. Despite 67% of Nigerians seeking care from private providers, TB case notification from the private sector was only 15% in 2019. Barriers such as limited diagnostic capacity and weak referral systems have hindered TB detection. The Global Fund GC7 TB/HIV Integrated Project introduced a structured Public-Private Mix (PPM) approach to expand case detection across six states: Ekiti, FCT, Kogi, Kwara, Nasarawa, and Rivers.

Intervention or response: The project implemented a Hub-and-Spoke model, engaging 2,472 private facilities, including 580 Private-for-Profit (PFP) hospitals and 53 Faith-Based Organizations (FBOs) as hubs, alongside 964 Patent Medicine Vendors (PMVs), 78 Community Pharmacies (CPs), 35 Standalone Laboratories (SALs), and 762 Traditional Birth Attendants (TBAs) as spokes. Providers were trained. Linkage Coordinators facilitated sample transport and ensured treatment linkage. Screening Officers conducted systematic screening at OPDs, while the Mobile Application for Tuberculosis Screening (MATS) tracked presumptive and positive cases. Financial incentives supported provider engagement.

Results/Impact: In 2024, the GC7 PPM model contributed 11,462 TB cases, with hubs detecting 7,233 (63%), PMVs 3,857 (34%), CPs 139 (1.2%), SALs 22 (0.2%), and TBAs 211 (1.8%). Rivers (4,956) and Nasarawa (3,638) led in notifications. PMVs contributed 69% of cases in Rivers, while Nasarawa had the highest from CPs (136) and TBAs (208). The structured referral system and digital tools improved case identification and treatment linkage.

Conclusions: A structured PPM model effectively increased TB case detection. Key achievements include improved sample referral, expanded diagnostics, and enhanced provider engagement. Sustaining incentives, expanding molecular diagnostics, and strengthening policy integration are critical for long-term success. Collaboration between government and private providers remains essential to achieving Nigeria's TB detection targets.

OA25-341-21 Turning the tide: Five years of enhanced TB detection in Southwestern Nigeria (FY20–FY25)

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Background and challenges to implementation: Tuberculosis (TB) remains a leading cause of morbidity and mortality globally and in Nigeria. According to the WHO Global TB Report 2023, Nigeria ranks first in Africa and sixth globally among high TB burden countries, with an estimated 467,000 cases in 2022 and a case detection rate of 62%. To address gaps in TB detection and care, the Government of Nigeria, with donor support, implemented multiple interventions including intensified case finding (ICF), expansion of diagnostic tools, and community-level TB surveillance and Contact Investigation.
Intervention or response: Between FY20 and FY25, the USAID TB-LON 3 project implemented in Lagos, Ogun, Osun, and Oyo states introduced critical interventions: scale up of TB services to over 1900 public and private health facilities, deployment of molecular diagnostic platforms, active community TB ICF, and engagement trained contact investigation team. Regular supportive supervision, data-driven reviews, and health system integration further strengthened service delivery.
Results/Impact: A review of quarterly TB notification data showed significant improvement in case detection. From FY20 Q3 to FY25 Q1, TB notifications increased from 972 to 12,024 cases across the four states. Notable peaks occurred in FY24 Q2 (11,942) and Q3 (12,024), demonstrating the impact of targeted community outreach and diagnostic expansion. A total of 111,259 TB cases were notified across the four states, reflecting the success of intensified Case finding and private sector engagement. The consistent upward trend in notifications underscores the effectiveness of integrated interventions, especially in high-burden communities and underserved areas.
Conclusions: Targeted interventions significantly improved TB case detection across the four states. Sustaining these gains requires continuous investment in diagnostics, community engagement, and private sector collaboration. Scaling this model nationally could accelerate Nigeria's progress toward ending TB as a public health threat. Stakeholders are encouraged to support uninterrupted program funding, strengthen health systems, and maintain innovations that bridge existing gaps.

OA25-342-21 Wheels of change: Strengthening TB sample referral and diagnosis through public-private collaboration Meru County experience (2022-2023)

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Background and challenges to implementation: Meru County is among the top 5 high burden counties for Drug Susceptible Tuberculosis and Drug Resistant TB in Kenya,thus requires efficient diagnostic systems to improve case detection and treatment outcomes.Weak specimen referral systems, logistical bottlenecks, and fragmented service delivery often delayed diagnosis and treatment initiation. In response, innovative public-private collaboration models were explored to improve TB diagnostic networks. This study is to evaluate the impact of public-private collaboration on strengthening the diagnostic capacity through an integrated transport and communication framework.
Intervention or response: A collaborative model involving the Ministry of Health Meru County AMREF, KCCB, RESOK and Jamii tekelezi, private courier services, and diagnostic laboratories was implemented Key interventions included deployment of a coordinated hub-and-spoke specimen referral system using motorbike riders, standardized training of healthcare workers on sample packaging and referral protocols, and digital tracking of specimens via mobile reporting tools. Data on turnaround time, number of samples referred, and TB case detection were collected pre- and post-intervention.
Results/Impact: A total of 24,419 specimen were processed in the laboratories out of which 5635 ((23%) were referral specimen.
The collaboration led to an increase in the volume of samples referred for TB testing from 7,333 in 2022 to 18,086 in 2023 and a positivity of 1,127(15.3%) in 2022 to

4,255(24%) in 2023,The system increased the number of TB case detection by 3098 samples(12.6%) A reduction in average turnaround time for GeneXpert results reduced from 14 days to 24 hours ensuring up to 94% of specimen reaching the hubs within the established target transport time, with sustainability, operational efficiency, and geographical reach, particularly in underserved rural and peri-urban areas.
Conclusions: The „Wheels of Change" illustrates the transformative potential of public-private partnerships in overcoming logistical barriers in TB diagnosis. Scaling such models nationally could significantly accelerate TB case detection and treatment initiation, contributing to End TB goals.

OA25-343-21 Enhancing TB detection using innovative screening technologies: Programmatic impact of mobile application for TB screening integration in private healthcare sector in Katsina State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in Nigeria, with significant underreporting in the private health sector, where a large proportion of patients seek care. Traditional paper-based TB screening systems often lead to suboptimal identification of presumptive cases, delayed referrals, and incomplete data reporting. In Katsina State, the absence of standardized digital tools for TB screening at private facilities has hindered early TB case detection. Addressing these challenges required a scalable, real-time, and user-friendly digital solution to enhance systematic screening and timely diagnosis.
Intervention or response: The Mobile Application for Tuberculosis Screening (MATs App) was integrated into routine TB screening in private health facilities under the Global Fund Community Public-Private Mix (GF-CPPM) project by KNCV Nigeria in Katsina State. This intervention enabled systematic symptom-based screening, with presumptive cases referred for molecular diagnosis. TB case detection data from pre-implementation (Q1 2024) and post-implementation (Q2 2024) periods were compared to assess impact.
Results/Impact: Between January and June 2024, 295,008 individuals were screened across private facilities in Katsina State. In Q1 (pre-implementation), 95,626 individuals were screened, detecting 736 drug susceptible tuberculosis (DS-TB) (0.8%) and 5 drug resistant tuberculosis (DR-TB) cases. In Q2 (post-implementation), 199,382 were screened, yielding 2,174 DS-TB (1.1%) and 9 DR-TB cases—representing 195% and 80% increases, respectively. The digital platform also improved the completeness and timeliness of case reporting and facilitated better linkage to diagnostic services.
Conclusions: The integration of the MATs App into private-sector TB screening demonstrated substantial gains in TB case detection. This digital intervention enabled efficient identification of presumptive cases, improved diagnostic referrals, and strengthened surveillance within an underutilized care sector.
These findings support the scale-up of digital tools like MATs App to optimize TB case finding in private health settings and underscore their value in accelerating progress toward national TB control targets.

OA25-344-21 Driving efficiency in TB notification: The impact of DHIS2 in Pakistan's private sector

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Background and challenges to implementation: Tuberculosis (TB) prevention in Pakistan has been hindered by delays in diagnosis, largely due to a paper-based reporting system—especially in the private sector, which serves over 86% of the population. While the Public-Private Mix (PPM) model enhanced collaboration and TB case notifications, manual processes slowed patient registration, follow-up, and data aggregation, affecting timely TB management.
Intervention or response: To address these delays, Mercy Corps Pakistan implemented a digital, case-based notification system using DHIS2. This transition enabled real-time registration, treatment monitoring, contact screening, and follow-up. With digital integration, bottlenecks from manual reporting were removed, leading to faster decision-making and more efficient program responses. DHIS2 is now operational across all 111 districts supported by Mercy Corps, ensuring streamlined TB surveillance.
Results/Impact: The DHIS2 system has registered 171,927 TB cases, marking a 580% increase from the 25,289 cases recorded during early implementation—demonstrating significant improvements in coverage and performance. Patient follow-up delays dropped from 89% to 53%, and follow-up test availability rose from 49% to 69%. Data completeness also improved, with missing contact numbers reduced from 81% to 49% and national ID gaps from 59% to 35%. In terms of time efficiency, 578 data entry

staff across 111 reporting districts brought down the average reporting time to 14.2 days post-quarter (ending 31 March 2025), compared to 45 days pre-DHIS2—marking a 68.4% improvement. Reports were submitted between 1 and 20 April 2025, reflecting enhanced speed and system responsiveness.

Indicator	Before DHIS2	After DHIS2	Remarks
Patient Follow-up Delays	89%	53%	Improved timeliness in follow-up
Follow-up Test Availability	49%	69%	Better outcome tracking
Missing Contact Numbers	81%	49%	Improved data completeness
Missing National ID Numbers	59%	35%	Improved data accuracy
Reporting Time Post-Quarter	45 days	14.2 days	68.4% faster reporting

DHIS2 Performance and Time Efficiency Overview.

Conclusions: The successful implementation of DHIS2 under the PPM-1 model has significantly improved TB case registration, data quality, and reporting efficiency. With proven impact across 111 districts, this digital model will now be expanded to PPM-2 and PPM-3, further strengthening TB surveillance and private sector integration in Pakistan.

OA25-345-21 Building TB diagnostic infrastructure in Uttarakhand State in India: A joint effort by government and corporate social responsibility

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Background and challenges to implementation: In early 2023, Uttarakhand state conducted a Diagnostic Network Optimisation exercise to assess the accessibility and upfront use of Nucleic Acid Amplification Test (NAAT) machines, for Tuberculosis (TB) diagnosis and Rifampicin resistance detection.
Analysis revealed that only 24% of people in hilly regions had access to NAAT laboratories, primarily located in district and sub-divisional hospitals, leading to diagnostic delays and patient drop-offs during referrals. In response, state adopted a decentralization strategy to improve accessibility and timely diagnosis.
This study evaluates the effectiveness of that strategy, focusing on its impact on diagnostic access and patient retention in Uttarakhand's mountainous areas.

Intervention or response: To improve access, the state first redistributed centrally located NAAT machines to peripheral health facilities. Additionally, corporate partners donated 40 more machines as part of their Corporate Social Responsibility (CSR) initiatives. Supply chain systems were streamlined, and regular state-level monitoring was undertaken on a roster basis.
Key performance indicators monitored included:
i. NAAT turnaround time,
ii. Presumptive sample testing rates,
iii. Use of upfront NAAT tests.
Analysis was done using data from Ni-kshay, India's digital TB surveillance platform, covering the 2022-2024 period.
Results/Impact: Number of functional NAAT laboratories rose by 73% in 2024 compared to 2022, leading to accessibility of these laboratories to 79% more people within 30 minutes' travel time. Presumptive TB testing increased by 77% (960 to 1697/100,000; p<0.0001).
Turnaround time for NAAT testing dropped significantly by 73% and proportion of individuals with TB diagnosed using upfront NAAT increased by 93%. Correspondingly, TB notification rates per 100,000 population moved from 228 to 239 (p<0.0001).

Parameters	2022	2023	2024	% change from 2022 to 2024
Population (X 100,000)	119	120	123	
Number of NAAT sites	78	89	135	73%
Population accessing NAAT laboratories within 30 minutes travel (%)	24	33	43	79%
Presumptive TB Examination Rate (per 100,000 population)	960	1316	1697	77%
Turnaround Time for NAAT testing (in days)	15	10	4	-73%
Individuals with TB subjected to upfront NAAT (%)	29	32	56	93%
TB Notification (per 100,000 population)	228	219	239	5%

Table 1: TB program indicators before and after intervention for improving access to diagnostic services with Government effort and CSR contributions in Uttarakhand state, India.

Conclusions: Enabling availability and accessibility of NAAT at peripheral centres, strengthened TB diagnostics, reduced delays, and improved access in underserved areas. This collaborative effort has enhanced early detection and created a more efficient and sustainable approach to TB elimination in hard-to-reach regions.

OA25-346-21 Intensified TB case finding in private hospitals in India: Transforming the incidental screening pathway with computer-aided detection

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Background and challenges to implementation: Public-private partnership is pivotal to Tuberculosis (TB) care delivery and management. In 2023, India reported 2.55 million cases of TB, of which 33% were notified by the private sector. NMP+ (Network of Maharashtra People with HIV), a community-based organization, implements the patient provider support agency (PPSA) initiative in alignment with the National Tuberculosis Elimination Programme (NTEP), engaging private-sector doctors for effective TB care delivery. However, chest X-rays taken at such facilities remain underutilized for TB detection due to resource constraints.

Intervention or response: All routine chest X-rays taken at the six, private, multi-speciality hospitals within the PPSA network were systemically screened for radiological TB signs, regardless of clinical symptoms, using CAD software (qXR v4 and qTrack, Qure.ai) from December 2024 to March 2025. The TB presumptive patients identified by CAD with a TB probability score (range: 0-1; threshold: 0.5) above the threshold, were promptly referred for confirmatory testing as per NTEP protocols.

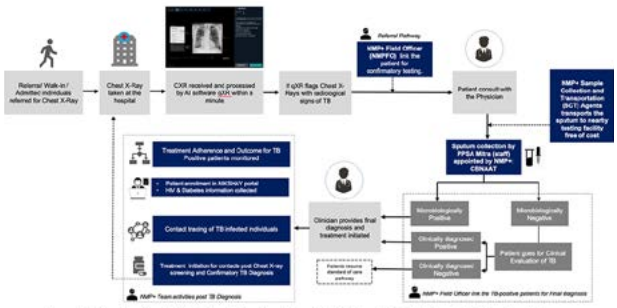

Figure: Workflow involving CAD for Chest X-Ray based Intensified TB Case Finding in Private Healthcare facilities

Results/Impact: Out of the 4522 chest X-rays screened at all the hospitals, 542 (11.9%) were identified as TB presumptive by CAD. 308(56.8%) cases were tested further and 34 (11.03%, 95%CI: 7.77%- 15.08%) were confirmed with tuberculosis over 4 months. The distribution of CAD probability scores for confirmed TB patients (age range: 23-80 years; 61.8% male) was found to be 0.908±0.12 (mean ± standard deviation). Compared to a historical baseline (December 2023 to March 2024), an increase of over 400% was observed in total TB case notifications from these 6 hospitals at the end of the intervention period.

Conclusions: CAD was integrated within the PPSA initiative to facilitate intensified TB case finding in private hospitals using Chest X-rays. A significant increase in TB notifications was observed from these facilities at the end of the intervention period, thus showing promise for scale up of this approach at national level to improve yield and patient outcomes.

OA26 Advancing TB care: Innovations in drugs, vaccines, diagnostics and treatment

OA26-347-21 Early bactericidal activity of oral Sanfetrinem cilexetil against pulmonary TB

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Background: Sanfetrinem cilexetil is an orally active β-lactam prodrug that inhibits *Mycobacterium tuberculosis* cell wall synthesis. We report findings from a Phase 2A randomized, open-label study (NCT05388448) that evaluated the early bactericidal activity (EBA), pharmacokinetics, safety and tolerability of oral Sanfetrinem cilexetil.
Design/Methods: We randomised 53 adult participants (79% male, mean age: 35 years, mean weight: 54kg) with newly diagnosed, pan-susceptible pulmonary tuberculosis (TB) to receive 14 days of Sanfetrinem cilexetil 1600mg BID (Sanf1600, n=19), Sanfetrinem cilexetil 2400mg BID (Sanf2400, n=17), or Rifampicin 35mg/kg (Rif35, n=17) as microbiological control. EBA was assessed by the daily decrease in sputum colony-forming unit counts using empirical Bayesian estimates from mixed-effects model, and Bayes estimates from this model were used to predict individual EBA. Plasma concentrations of Sanfetrinem cilexetil were measured on day 13. Adverse events (AEs) were assessed daily.
Results: The median predicted 14-day EBA (log_{10}CFU/mL; 95% prediction interval) was 0.72 (0.46-1.87) for Sanf1600, 0.80 (0.40-1.28) for Sanf2400 and 3.94 (1.61-8.79) for Rif35, all significantly different from zero.
For Sanf1600 and Sanf2400 the mean maximum serum concentrations (Cmax; mg/L) were 3.92 (range: 1.89-5.29) and 3.79 (range: 0.54-6.61), and mean area under the curve ($AUC_{0\text{-}8h}$; h*mg/L) was 12.3 (range: 8.36-16.70) and 13.0 (range: 2.82-18.9), respectively.
Most AEs were mild (74.4%) or moderate (20.0%). Nine participants withdrew from the investigative study arms (Sanf1600: 3, Sanf2400: 6), with two Sanf2400 withdrawals due to drug-related AEs.
The other withdrawals were due to withdrawal of consent, worsening of TB or other reasons considered unrelated to treatment. Gastrointestinal AEs were frequent (Sanf1600: 84.2%, Sanf2400: 100%). No drug-related deaths occurred.
Conclusions: Sanfetrinem cilexetil was tolerated in the Sanf1600 group and both Sanfetrinem cilexetil dosages showed significant EBA over 14 days.
Unexpectedly, both 1600 mg BD and 2400 mg BD dosages exhibited similar bactericidal activity and similar serum exposure.

OA26-348-21 Early efficacy and preliminary safety of a novel 6-month regimen containing contezolid, delamanid, bedaquiline (CODA) and fluoroquinolones for Chinese rifampin-resistant people with TB

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Background: Contezolid (CZD), a next-generation oxazolidinone with reduced myelotoxicity, could optimize 6-month rifampicin-resistant TB (RR-TB) regimens while mitigating linezolid (LZD)-associated toxicities that impair regimen durability.
Real-world evidence from China—contributing 7.3% of global RR-TB cases—remains critical for regimen adoption.
Design/Methods: The ongoing INSPIRE-CODA trial is a multicenter randomized non-inferiority study comparing 6-month CZD-based therapy (800mg BID + delamanid/bedaquiline/fluoroquinolone/clofazimine) against standard 18-month regimens in RR-TB adults.
Primary endpoint combines WHO-defined favorable outcomes at treatment completion and 24-month follow-up.
This interim analysis evaluates:
1. Time-to-sputum-culture conversion (Kaplan-Meier/Cox models),
2. Month-2 culture negativity (chi-square), and;
3. Safety in modified intent-to-treat (mITT) population.
Results: Among 212 randomized participants (107 CODA vs 105 control), 90 vs 93 reached mITT eligibility with balanced baseline characteristics. CODA arm demonstrated 87.8% dose adherence and 85.6% (77/90) favorable outcomes at treatment completion.
Median time-to-culture-conversion was identical in both mITT (28 days both arms; HR 0.97, 95%CI 0.72-1.32, Figure 1A) and per protocol (PP) populations (28 days both arms; HR 1.13, 95%CI 0.82-1.56, Figure 1B).
Subgroup analyses by FQ susceptibility showed consistent patterns (FQ-sensitive: HR 1.09, 95% CI 0.74–1.60; FQ-resistant: HR 0.87, 95% CI 0.53–1.43, Figure 1C).

Month-2 negativity rates showed no intergroup difference (83.3% vs 81.7%, p=0.93). CODA significantly reduced overall AEs (38.9% vs 67.7%) and LZD-related toxicities: peripheral neuropathy (2.8% vs 17.2%) and myelosuppression (5.6% vs 28.0%). Common CODA AEs included gastrointestinal events (13.5%) and transaminase elevation (9.0%).

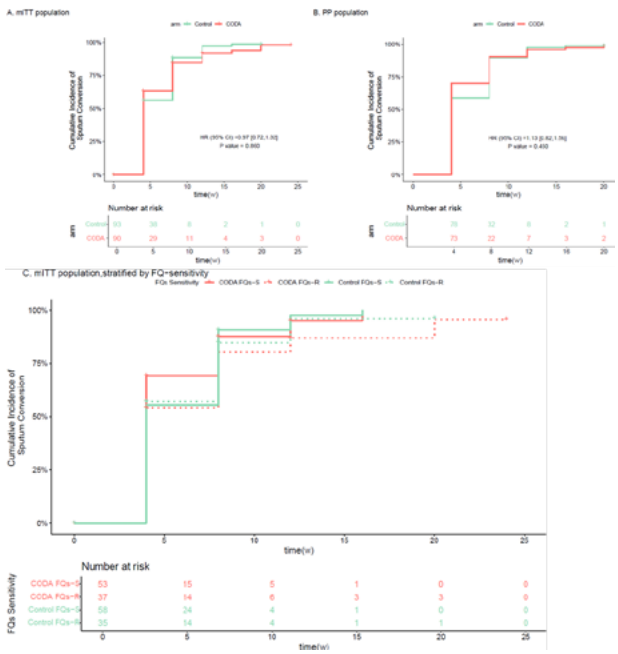

Figure 1: Sputum conversion by cut-off date (Mar. 20, 2025)
mITT: modified intent-to-treat, PP: per protocol, HR: hazard ratio, FQs: fluoroquinolone, FQs-S: fluoroquinolone-sensitive, FQs-R: fluoroquinolone-resistant, w: week.

Conclusions: This first real-world evaluation of 6-month CZD-containing regimens in China demonstrates non-inferior early efficacy versus standard therapy with markedly improved neurological/hematological safety. CZD emerges as a viable LZD alternative for RR-TB optimization, though 24-month follow-up will confirm sustained outcomes.
ClinicalTrials Identifier: NCT06081361

OA26-349-21 Safety and efficacy of TBAJ-876 In combination with pretomanid and linezolid: Week 8 analysis result of NC-009

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Background: TBAJ-876 is a second-generation diarylquinoline with greater *in vitro* potency, favorable preclinical safety, and treatment-shortening demonstrated in murine models, relative to bedaquiline. In phase 1 studies, TBAJ-876 was safe and well tolerated. NC-009 study is an ongoing randomized, controlled, phase 2 study evaluating 3 doses of TBAJ-876 in combination with pretomanid and linezolid for 8 weeks, followed by HR, and evaluates both 15- and 26-week total treatment durations.
Design/Methods: 309 participants with newly diagnosed, smear-positive, drug sensitive tuberculosis (TB) were equally randomized to 5 treatment arms: HRZE/HR (8-weeks/18 weeks); BPaL (26-weeks); three doses of TBAJ-876 (25, 50, or 100mg) in combination with Pa-L (8 weeks), followed by HR for 7 or 18 weeks. Primary endpoint is time to stable sputum conversion (SSC) by week 8 based on weekly MGIT.
Participants randomized to TBAJ-876 could stop treatment at week 15 based on negative week 8 MGIT result and resolution of TB symptoms.
Results: The proportions of participants with SSC by week 8 were 31%, 46%, 59%, 45% and 45% for the 25, 50, 100mg TBAJ-876PaL, BPaL and HRZE arms, respectively. Hazard ratios for 100mg TBAJ-876 SSC at week 8 versus BPaL and HRZE were 1.53 (95% CI 0.93, 2.52) and 1.37 (95% CI 0.83, 2.27), respectively. Proportions of TBAJ-876PaL participants who met stopping criteria at week 15 were 28%, 46% and 64% in the 25, 50 and 100mg (p <0.001, vs 25 mg) arms, respectively. TBAJ-876PaL was well-tolerated with comparable safety across doses.
Through 8 weeks, the TBAJ-876PaL and BPaL arms experienced fewer ≥grade 3 treatment-emergent adverse events than the HRZE arm.
Conclusions: TBAJ-876 in combination with Pa-L demonstrated dose-dependent efficacy. The 100mg TBAJ-876PaL arm had higher 8-week sputum conversion than BPaL and HRZE, which were comparable, and a favorable safety profile compared with HRZE.

OA26-350-21 Safety of the novel TB vaccine H107e/CAF®10b in BCGexposed, M.tuberculosis-uninfected adults in Gauteng, South Africa: First in human trial

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Background: The H107e protein subunit vaccine consists of eight Mtb-specific antigens not shared with BCG, which eliminates the risk of cross-reactivity to BCG. The safety and reactogenicity of H107e-antigen with liposomal adjuvant CAF®10b was evaluated in BCG-exposed, Mtb-uninfected adults.

Design/Methods: A phase 1a open-label trial (nTB-01) was conducted. Healthy IGRA negative adults aged 18-45 years were sequentially enrolled into one of four study arms to receive two intramuscular injections 28-days apart; H107e-antigen (20mcg) [Arm-1], full-dose CAF®10b adjuvant [Arm-2], H107e/low-dose CAF®10b vaccine [Arm-3] or H107e/full-dose CAF®10b vaccine [Arm-4]. Arm-4 participants received H107e-antigen intranasal mucosal recall 56-days post-injection; Arm-4a (15mcg) and Arm-4b (30mcg). Reactogenicity assessments occurred up to 7-days post-investigational product (IP) administrations with seven months follow-up.

Results: From March to September 2024, 40 healthy adults were enrolled into Arm-1 (n=5), Arm-2 (n=5), Arm-3 (n=15) or Arm-4 (n=15). The median age was 22 (IQR:18-42) years, 52.5% male, 97.5% Black-African, with a median BMI of 23.6 (IQR:18.1-31.7) kg/m². Following two injections, 71 solicited injection site reactions occurred in 35/40 (87.5%) participants. The most frequent local reaction was injection site pain in 35/40 (87.5%) participants. Of 107 post-injection solicited systemic reactions in 29/40 (72.5%) participants, headache was most frequent in 19/40 (47.5%). Similarly, of 18 post-intranasal systemic reactions in 5/15 (33.3%) participants; headache occurred in 4/15 (26.7%). Of 24 post-intranasal local solicited reactions the most frequent were nasal congestion and sneezing in 5/15 (33%) participants each. (Table 1) The majority of adverse events (AEs) were mild to moderate with seven severe events reported post-injection; two laboratory abnormalities not related to IP and five resolved solicited systemic reactions in Arm-4. No serious AEs or AEs of special interest were observed.

	H107e (Arm 1) N (%) E [IR]	CAF10b (Arm 2) N (%) E [IR]	H107e/CAF10b-low adjuvant dose (Arm 3) N (%) E [IR]	H107e/CAF10b-full adjuvant dose (Arm 4) N (%) E [IR]	H107e/CAF10b + low dose mucosal recall (Arm 4a) N (%) E [IR]	H107e/CAF10b + full dose mucosal recall (Arm 4b) N (%) E [IR]
Safety analysis set (N)	5	5	15	5	5	10
Any Adverse events	5 (100.0) 29 [0.90]	4 (80.0) 24 [0.74]	15 (100.0) 94 [0.93]	15 (100.0) 147 [1.51]	5 (100.0) 83 [2.50]	10 (100.0) 64 [1.00]
Any Solicited Adverse events*	4 (80.0) 23 [8.77]	4 (80.0) 13 [4.96]	15 (100.0) 65 [8.26]	15 (100.0) 119 [10.08]	5 (100.0) 69 [17.54]	10 (100.0) 50 [6.35]
Any Solicited systemic reactions	4 (80.0) 19	4 (80.0) 10	10 (66.7) 33	11 (73.3) 45	5 (100.0) 31	6 (60.0) 14
Solicited injection site reactions	3 (60.0) 4	3 (60.0) 3	14 (93.3) 32	15 (100.0) 32	5 (100.0) 12	10 (100.0) 20
Solicited local reactions post mucosal recall					4 (80.0) 16	3 (30.0) 8
Solicited systemic reactions post mucosal recall					2 (40.0) 10	3 (30.0) 8

N: Number of participants, %: Percentage of safety analysis set.
E (IR): Number of events and incidence rate calculated as number of events divided by exposure in months.
* (IR) for solicited adverse events are calculated with collection period of solicited adverse events (up to 7 days after each vaccination).

Table 1: Adverse Events by study arm post injection and post intranasal mucosal recall (nTB01).

Conclusions: H107e-antigen and CAF®10b adjuvant at two doses, individually or in combination, and H107e-antigen intranasally were well tolerated in South African BCG-exposed, Mtb-uninfected adults.

OA26-351-21 Enhancing the acceptability of a phase three TB vaccine trial in the Matlosana sub-district of South Africa: Using the Social Marketing Model

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Background and challenges to implementation: The biggest take home from the Covid-19 pandemic; was the vaccine misconceptions when ignored these can spill over to trial participation. It is key for researchers to understand barriers and facilitators of vaccine trial acceptance. When left unaddressed vaccine misconceptions poses a barrier to trial participation. To increase the acceptability of a phase three TB vaccine trial, the social marketing model was utilized to promote the acceptance of the trial.
Intervention or response: Focused on four main components product, promotion, place, price.
1. Product: the phase 3 TB trial
2. Promotion-entails communication and facilitating the acceptability of the trial, this was done through dialogues, education and awareness that addressed the misconceptions
3. Place- the contact point- the CRS this is where the trial is conducted,
4. Price- the counter-performance expected from the "consumer" in this case the potential participants, entailed providing clear and transparent information about the trial and study vaccine.
Five steps followed:
1. situational analysis,
2. identifying and analyzing barriers and facilitators,
3. formulating a marketing plan.
4. implementing the marketing plan, and
5. conducting a program evaluation.
Results/Impact: Identified barriers:
1. Concerns around the safety of the study vaccine,
2. Fears that vaccine causes TB,
3. CRS buys and sells blood of volunteers,
4. Gatekeepers e.g. parents, caregivers and legal guardians of adolescents raised concerns about the safety of the vaccine, facilitators the drive to end TB and stakeholder buy in.
The marketing plan addressed barriers and leveraged on facilitators raised in steps 1 and 2. Using the model had a positive impact on community support which increased participation.
Conclusions: Utilizing the model enhanced recruitment efforts and acceptance of the trial by the broader community, potential participants and the gate keepers. The model has the potential to be used when a novel TB vaccine is introduced to the public to enhance acceptability.

OA26-352-21 Imprecision in TB infection outcomes: Implications for non-inferiority vaccine trials

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Background: Randomised trials comparing new vaccines against tuberculosis for use in neonates and infants, for whom Bacille Calmette-Guérin (BCG) vaccination is established practice, are using tuberculosis infection as the primary endpoint in a non-inferiority design. Markers of tuberculosis infection have imperfect sensitivity and specificity. Flaws in the non-inferiority trial design typically bias towards the null, which may result in falsely declaring non-inferiority.
Design/Methods: We conducted a statistical simulation study to assess the impact of imperfect sensitivity and specificity of tuberculosis infection tests on the interpretation of tuberculosis vaccine trials testing a non-inferiority hypothesis of an infection primary outcome.
Data were generated in three 2-year cumulative risk of tuberculosis infection scenarios (2%, 5%, and 8%). The specificity of tests of tuberculosis infection was assumed to range from 100% to 85%, while the sensitivity was assumed to range from 100% to 64%. Log-binomial regression was used to estimate the relative risk of tuberculosis infection in simulated trials. We assessed the type-I and type-II error implied by these simulated trials.

Test accuracy	Control vaccine		Experimental vaccine		Type-I error (alpha)		
Sensitivity; Specificity	True risk of TB infection	Observed risk of TB infection	True risk of TB infection	Observed risk of TB infection	Expected type-I error	Estimated type-I error	Monte Carlo error
100%; 100%	0.02	0.02	0.025	0.025	2.5%	2.2%	0.3%
100%; 100%	0.05	0.05	0.0625	0.0625	2.5%	2.5%	0.3%
100%; 100%	0.08	0.08	0.10	0.10	2.5%	2.0%	0.3%
95%; 95%	0.02	0.068	0.025	0.073	2.5%	96.8%	0.4%
95%; 95%	0.05	0.095	0.0625	0.106	2.5%	53.2%	1.1%
95%; 95%	0.08	0.122	0.10	0.140	2.5%	27.8%	1.0%

Table shows the simulated observed risk of TB infection for an experimental vaccine for which the true risk of TB infection is 1.25 times higher than the control vaccine and the risk of falsely declaring non-inferiority of the experimental vaccine.
TB: tuberculosis;
Expected type-I error: type-I error (alpha) per the study design parameters.
Estimated type-I error: Probability of falsely declaring non-inferiority when the true risk of TB infection is 1.25 times higher with the experimental vaccine.
Monte Carlo error: standard error of the estmated type-I error due to random variation in the simulation procedure.

Results: With 100% sensitivity and specificity, type-I and type-II error were both approximately equal to the expected values (2.5% and 80%, respectively). With modest deviations from perfect sensitivity and specificity (95% for both), the risk of falsely declaring non-inferiority (type-I error) was 96.8%, 53.2%, and 27.8% in the 2%, 5%, and 8% cumulative tuberculosis risk infection scenarios, respectively (Table).
Conclusions: Tuberculosis vaccine non-inferiority trials using an infection primary outcome must be designed and interpreted accounting for the specificity of the tests used to measure infection, otherwise they risk declaring non-inferiority by default. Until there is a test for TB infection with higher specificity than the interferon-gamma release assay, the use of the non-inferiority trial design for TB vaccine prevention of infection outcomes is not recommended.

OA26-353-21 Refining research outcomes: Lessons from the setup of an endpoint review committee in TB observational diagnostic studies

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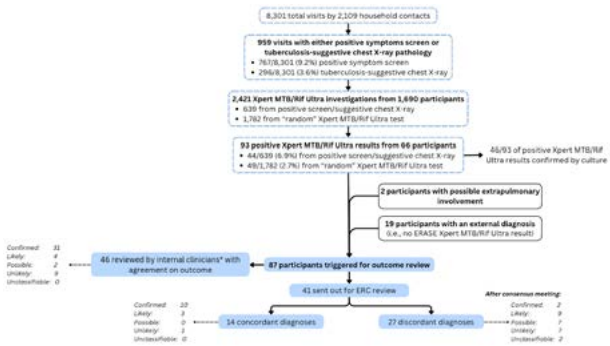
Background: Diagnosing tuberculosis remains challenging and limitations of current diagnostic tools. ERASE-TB, a longitudinal cohort study conducted across three high-burden countries, aimed to validate novel diagnostics for early detection of tuberculosis. To ensure high-fidelity outcomes, an Endpoint Review Committee (ERC) was convened.
Design/Methods: ERASE-TB enrolled 2,109 household contacts, who were followed up every 6 months for a maximum of 24 months, with comprehensive clinical, microbiological, and radiological assessments at each visit. Clinical presentation, radiological and microbiological results were summarised for participants who underwent in-depth tuberculosis investigation due to a suggestive X-ray or positive Xpert MTB/Rif Ultra Two study team clinicians reviewed the clinical summaries, with discordant decisions assessed by the ERC (four members including a programme manager, clinicians, and a radiologists) who classified cases based on predefined definitions (confirmed, likely, possible, unlikely).
A consensus meeting was organised to resolve discordances. Semi-structured interviews with ERC members explored their experiences and challenges in tuberculosis classification.
Results: A total of 87 clinical summaries underwent review, 46 were agreed internally, with the majority being categorised as confirmed tuberculosis (31/46, 67.4%). Among the remaining 41, the ERC reviewers agreed on only 14 (34.1%) classifications, with the majority being classified as confirmed tuberculosis (10/14, 71.4%).
Following the consensus meeting for the discordant 27, most were classified as likely (9/27, 33.3%), followed by possible and unlikely (both 7/27, 25.9%). Discordances between reviewers were associated with their professional background. Qualitative interviews highlighted the complexity of tuberculosis diagnosis, value of longitudinal measurements and the tension between academic and clinical pursuits as the prospective clinical judgement would have likely been different to this retrospective academic analysis.



Conclusions: Standardized tuberculosis classification frameworks and real-time expert review can improve diagnostic accuracy and comparability across studies. Future research should integrate ERC processes prospectively to refine tuberculosis case definitions and ensure robust clinical and research outcomes.

OA26-354-21 TRIDORE: Intensive-phase-throughout regimen is safer and more efficacious than triple-dose regimen for retreatment of rifampicin-susceptible TB

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Background: High-dose rifampicin and isoniazid are known to be safe but were not yet combined in a single regimen.
TRIDORE (TRIple-DOse RE-treatment, Clinicaltrials.Gov=NCT04260477) is a pragmatic open-label randomized clinical trial in nine Niger National Tuberculosis Program clinics supported by Damien Foundation.
In previously treated patients with rifampicin-susceptible recurrent tuberculosis (TB), we compared a 6-month first-line regimen, including triple-dose of both rifampicin and isoniazid, with a 6-month intensive-phase-throughout regimen. We assessed non-inferiority (10% margin) for safety and compared efficacy.
Design/Methods: Pragmatic open-label randomized clinical trial. Consenting participants were randomly assigned to either the intervention arm ($6R^3H^3ZE$, with pyridoxin; R^3: 30 mg rifampicin/kg, H^3: 15 mg isoniazid/kg; Z: pyrazinamide; E: ethambutol) or the control arm (6RHZE). Routine monitoring and liver function tests (ALT) were performed at fixed intervals. The primary safety endpoint was the occurrence of any TB drug-related grade 3-5 adverse event (AE).
Non-inferiority was assessed with a 95%CI around the difference (10% non-inferiority margin). The efficacy endpoint was treatment success versus unfavorable outcomes, with correction for re-infection.
Results: Between March 2021 and February 2022, 129 patients were enrolled: 65 and 64 were treated with $6R^3H^3ZE$ and 6RHZE, respectively (Table 1).
For the primary safety endpoint $6R^3H^3ZE$ was not non-inferior to 6RHZE (difference 7.7%: 7.7% vs 0.0%; p=0.02; 95%CI:1.2,14.1; with upper bound above 10%), and was associated with significantly more serious adverse events (16.9% vs 4.7%, p=0.04).
Moreover, $6R^3H^3ZE$ was less efficacious than 6RHZE (86.2% vs 96.8% success, p=0.03).

	Total	$6R^3H^3ZE$		6HRZE	
Total safety analysis	**129**	**65**		**64**	
Any grade 3-5 AE $	5	5	7.7%	0	0.0%
Serious AE	14	11	16.9%	3	4.7%
Hepatotoxicity #	4	4	6.2%	0	0.0%
Total efficacy analysis µ	**128**	**65**		**63**	
Success	**117**	**56**	**86.2%**	**61**	**96.8%**
Cure	114	55	84.6%	59	93.7%
Completion	3	1	1.5%	2	3.2%
Unfavourable outcome	**11**	**9**	**13.8%**	**2**	**3.2%**
Failure - same strain	0	0	0.0%	0	0.0%
Died	7	5	7.7%	2	3.2%
LTFU	1	1	1.5%	0	0.0%
Discontinued £	3	3	4.6%	0	0.0%

$ Assessed as probably or definitively related
# Grade 3 or higher increase of ALT, or grade 2 increase with jaundice
µ One patients excluded from the efficacy analysis
£ Patient's decision
AE: adverse event

Table 1. Safety and treatment outcomes in patients treated in the TRIDORE trial, randomised to either a triple-dose or intensive-phase throughout first-line re-treatment regimen.

Conclusions: In patients in need of retreatment for rifampicin-susceptible TB, the TRIDORE trial showed that a triple-dose regimen was not non-inferior compared to an intensive-phase-throughout regimen in terms of safety. The triple-dose regimen was associated with both the occurrence of unfavorable safety and treatment outcomes. We propose the intensive-phase-throughout regimen for the retreatment of rifampicin-susceptible TB.

OA26-355-21 Multi-method monitoring of response to individualised all-oral drug-resistant TB therapy reveals rapid conversion to negative in three high burden countries

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Background: The global scale-up of all-oral regimens for drug-resistant tuberculosis (DR-TB) demands reliable tools to monitor treatment response. Conventional bacteriological methods are slow or insensitive. This study

evaluated the molecular bacterial load assay (TB-MBLA), Mycobacteria Growth Indicator Tube (MGIT) culture and smear microscopy (SM) to monitor DR-TB treatment response.

Design/Methods: In Cohort 1 of the TRiAD study, participants with rifampicin-resistant TB (RR-TB) in Ethiopia, Nigeria and South Africa were tested using the Xpert XDR assay to determine resistance to first- and second-line drugs and were prescribed individualized, all-oral regimens accordingly. TB-MBLA (in a subset), MGIT, and SM were used longitudinally to assess treatment response. Outcomes included changes in bacterial load (log_{10}CFU/mL), MGIT time-to-positivity (TTP), and smear grade (SG). Scanty SG was quantified as +0.25 for analysis purposes. Analysis focused on early response (month 2) and sustained response (month 9).

Results: Overall, 845 participants were enrolled with 401 receiving pre-treatment TB-MBLA test of whom 276 were positive and included in longitudinal treatment response analysis. By month two, >80% had converted to negative across all three methods. At month 9, positivity fell to 0.7% (SM), 1.5% (MGIT), and 0.0% (TB-MBLA) (Figure 1A). Rate of TB-MBLA-measured bacterial load clearance was consistent with increasing MGIT TTP, median bacterial load dropped from 4.4(3.1-5.3) to 0.0(0.0-0.0) log_{10}CFU/mL and correspondingly, TTP increased from 13(8.3-25.8) to 42(33-42) days by month-2 of treatment, and remained so throughout the treatment follow-up period. The median SG dropped from +1(0.3-2) to +0.3(0.3-0.3) by month-9 of treatment but had the lowest consistency due to many missed measurements post-month-2 of treatment. High pre-treatment bacterial load was correlated with short TTP, and high SG (Figure 1B).

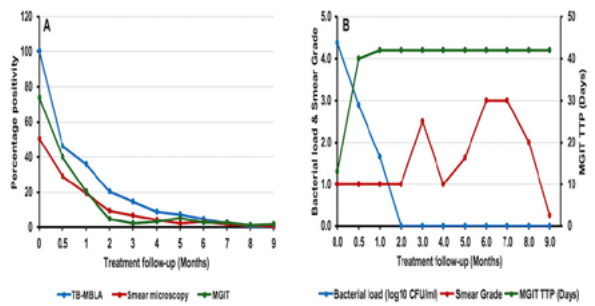

Figure 1: Treatment response measured by tuberculosis Molecular Bacterial Load Assay (TB-MBLA-blue curve), Mycobacteria Growth Indicator Tube (MGIT-green curve) and Smear Microscopy (SM-red curve). A) Decreasing proportion of participants that were TB positive by TB-MBLA, MGIT and SM across 9 months of treatment follow-up. B) The median bacterial load, time-to-positivity (TTP) and Smear grade by TB-MBLA, MGIT and SM across the treatment follow-up period. Higher bacillary load corresponded to shorter MGIT TTP. Fewer data points post month-2 made median smear grade results inconsistent to TB-MBLA and MGIT.

Conclusions: Individualised DR-TB treatment achieves faster rate of conversion-to-negative. The 4h-to-result TB-MBLA test enables early, culture-free monitoring of treatment response, its integration could strengthen clinical management and accelerate programmatic decision-making in high-burden settings.

OA26-356-21 Nebulised bronchodilator-enhanced sputum induction in presumed smear-negative pulmonary TB: A randomised controlled trial (NeB-TB)

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Background: Delayed diagnosis of pulmonary tuberculosis (TB), especially in settings with limited bronchoscopy resources, worsens clinical outcomes and increases transmission risks. Sputum induction is a non-invasive and effective alternative, but improvements in the induction method could further enhance TB diagnostic yield.

We investigated whether adding nebulized bronchodilators could enhance sputum induction effectiveness in patients with clinically presumed smear-negative pulmonary TB.

Design/Methods: In this randomized controlled trial conducted at King Chulalongkorn Memorial Hospital, Thailand, 204 adults with clinically presumed pulmonary TB and negative Xpert MTB/RIF Ultra results or insufficient sputum production were enrolled between June and September 2024.

Participants were randomly assigned to either conventional sputum induction using 3% hypertonic saline alone (n=101), or the novel sputum induction using nebulized bronchodilator combined with 3% hypertonic saline (n=103).

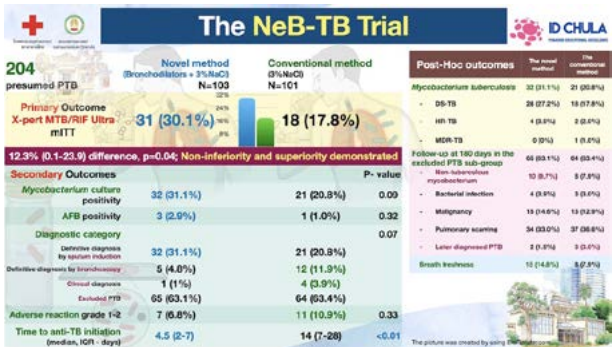
The primary outcome was the proportion of confirmed TB diagnoses via Xpert MTB/RIF assay.

(*Clinical Trials Registration:* TCTR20240709001)

Results: TB diagnosis rates by Xpert MTB/RIF were significantly higher in the novel group (30.1%; number needed to diagnose [NND]=4) compared to the conventional group (17.8%; NND=6), with a difference of 12.3% (95% CI: 0.1–23.9%, p=0.04). The novel sputum induction method increased mycobacterial culture positivity (31.1% vs. 20.8%) and reduced the need for bronchoscopy (4.8% vs. 11.9%).

Participants in the novel group reported fewer adverse reactions, greater comfort, required fewer induction rounds, and initiated TB treatment significantly sooner (4.5 vs. 14 days; p<0.01).

The method was particularly beneficial for outpatients (p=0.04) and showed promising trends in patients with chronic obstructive pulmonary disease.



Conclusions: The novel sputum induction using nebulized bronchodilators demonstrated superiority over conventional induction, resulting in higher diagnostic yield, improved patient comfort, reduced need for invasive procedures, and accelerated initiation of TB treatment. This safe, cost-effective, and patient-friendly method could transform TB diagnostics, especially in resource-limited settings.

OA26-357-21 UNITE4TB – DECISION: A BTZ-043 phase IIB dose-ranging trial in combination with bedaquiline and delamanid

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Background: BTZ-043, a DprE1-inhibitor with proven bactericidal activity in phase IIA trials is one of six novel drug candidates currently under evaluation in phase II trials within UNITE4TB, a large European-led TB clinical trials network.

Design/Methods: UNITE4TB-DECISION is a Phase IIB, Open-Label, Randomized Controlled dose-ranging trial to define the safety, tolerability, pharmacokinetics, and exposure-response relationship of three doses of BTZ-043 (T) in combination with Bedaquiline (B) and Delamanid (D).

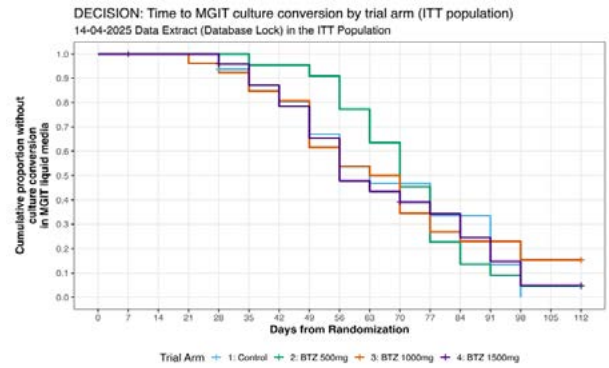
In Tanzania and South Africa, adults participant with newly diagnosed drug-sensitive pulmonary tuberculosis were randomized into one of four treatment arms: BTZ-043 500mg (BDT_{500mg}), 1000mg (BDT_{1000mg}),1500mg (BDT_{1500mg}), or Moxifloxacin 400mg (BDM) each added to bedaquiline and delamanid for 16 weeks. Sputum samples were taken weekly to measure the change in bacterial load by time to positivity (TTP) using the mycobacterial growth indicator tube system (MGIT™). Safety was assessed through weekly electrocardiography, safety blood tests, vision testing, and physical and neurological examinations. Pharmacokinetic measurements were done at week 4 and 8.

Results: Between September 2023 and July 2024 183 individuals were screened for eligibility. 92 were enrolled and assigned to BDT_{500mg} (n=22), BDT_{1000mg} (n=28), BDT_{1500mg} (n=26) and BDM (n=16).

81.5% of participants were male, 90.2% were HIV negative.

64.1% had baseline grade 3+ smear results, and 77.2% had cavities. Three participants (one in each BTZ-043 arm) experienced serious adverse events: increased liver enzymes, hepatotoxicity and brief psychiatric disorder. Nine participants experienced grade 3 events.

No grade 4 events occurred. The slope of increase of TTP over time was comparable between BDT_{1000mg}, BDT_{1500mg} and BDM; the slope for BDT_{500mg} was lower than BDM, p = 0.005. Time to culture conversion showed consistent results (Figure).



Conclusions: Pending the final PK-PD model, we conclude that BTZ-043 1000mg is the appropriate dose based on tolerability, efficacy, and tablet burden for further clinical development in UNITE4TB.

OA27 Institutional hotspots: Addressing TB transmission in hospitals and prisons

OA27-358-21 Spatial distribution of TB among healthcare workers in Brazil: High-density areas and occupational risk (2013-2023)

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Background: Certain occupational categories face significantly higher risk of tuberculosis infection compared to the general population. The main risk groups include nursing professionals (3-20 times higher risk), clinical pathologists (6-11 times), bacteriology laboratory technicians (2-9 times), pulmonologists (6 times), and students of Medicine, Nursing, and Physiotherapy (4-8 times).
This study aimed to identify the clinical forms, years, and regions with the highest TB case density among healthcare professionals in Brazil.
Design/Methods: This ecological exploratory study analyzed all 27 Brazilian federative units. The population comprised TB cases among healthcare professionals (2013-2023), using data from DATASUS and IBGE. Researchers conducted descriptive analyses, geospatial analysis, and spatial variation analysis using kernel density estimation with QGIS 3.35.15.
Results: The study identified 10,247 TB cases among healthcare professionals. Pulmonary form accounted for 70% of cases, extrapulmonary 26.2%, and 3.8% presented both forms. 2018 and 2020 had the highest notifications, while 2022-2023 showed increases totaling 1,188 cases. Kernel density analysis identified hotspots in São Paulo, Rio de Janeiro, Espírito Santo, and Minas Gerais.
Conclusions: Brazil continues to show high TB occurrence among healthcare professionals. Only two states with highest case density in this population coincide with states having highest TB incidence generally.
This highlights how urban density impacts occupational exposure. Specific protective actions needed include periodic TB screening, integrated notification systems, and continuous monitoring of work environments.

OA27-359-21 Beyond the workplace: A qualitative study of the impact of TB-related stigma on the private lives of healthcare workers in Indonesia

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Background: Tuberculosis (TB)-related stigma affects not only patients but also healthcare workers (HCWs) involved in TB care. While previous research has focused on workplace discrimination, limited studies explore how stigma influences HCWs‘ private lives. This study examines the **social, familial, and psychological impact** of TB stigma on HCWs.
Design/Methods: A qualitative study was conducted using semi-structured in-depth interviews with 30 HCWs across West Kalimantan Province, West Sumatra Province, and South Sulawesi Province, Indonesia. Participants were purposively sampled from hospitals, primary healthcare centers, and TB treatment units. Interviews were transcribed, coded, and thematically analyzed using Braun and Clarke's framework.
Results: Healthcare workers reported experiencing TB-related stigma that significantly impacted their personal lives. Social exclusion was common, with participants describing instances of avoidance, rejection, and discriminatory behavior from neighbors and community members who feared transmission. Within their families, several HCWs encountered emotional distance and mistrust, as spouses and relatives expressed concerns about infection, leading to strained relationships and feelings of isolation.
This contributed to considerable psychological distress, including anxiety, emotional exhaustion, and a sense of being misunderstood or devalued. Many HCWs also engaged in self-isolation and actively avoided disclosing their professional roles, particularly in social settings, to protect themselves from further stigma.
Finally, participants highlighted a lack of institutional support, noting the absence of formal mechanisms to address stigma or provide mental health assistance. In response, they relied on individual coping strategies, such as self-motivation, spirituality, or peer support, to manage the emotional burden.
Conclusions: TB-related stigma extends beyond the workplace, affecting HCWs‘ personal relationships and mental health. Addressing this issue requires community education to dispel TB misconceptions, family-based interventions to foster support, institutional policies to create stigma-free workplaces, and mental health services to protect HCWs‘ well-being. Multi-level interventions are essential to reducing HCW stigma and strengthening TB control efforts in Indonesia.

OA27-360-21 The uptake of TB preventive therapy among primary healthcare practitioners: A retrospective cohort study from Montreal

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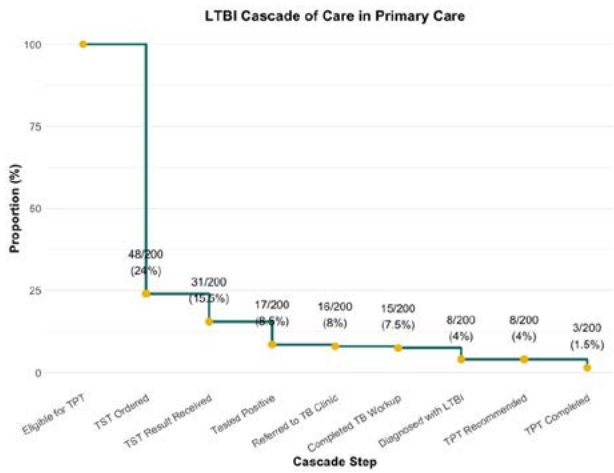
Background: Tuberculosis (TB) remains an important public health problem in Canada, with foreign-born individuals in Canada being disproportionately affected(1).
Since 5–10% of individuals with TB infection (TBI) progress to active disease, TB preventive therapy (TPT) is crucial for reducing the disease burden(2).
Despite established guidelines, significant drop-offs occur in the TBI care cascade(3). Primary care settings are promising for improving TPT uptake due to strong patient-provider relationships(4).
This study aims to assess primary care's performance in the cascade of TBI care.
Design/Methods: This retrospective chart review was conducted at a primary care clinic in Parc Extension serving predominantly immigrants and refugees. Electronic medical records were used to recreate the cascade of care for TBI. Bivariate logistic regression was used to study the association between patient characteristics and the probability of being tested in primary care.



Results: We reviewed 677 charts to identify 200 patients eligible for TBI testing, whose mean age was 36.1 years (± 17.2), and 70% were females. Only 48/200 (24%) had a TST ordered, representing the most significant point of attrition in the cascade of care. 48 patients (24%) were tested, 31(15.5%) received their test results, and 17 (54% of the tested) were TST-positive. 16 (8%) were referred to TB clinic for evaluation of TB disease, 15(7.5%) completed evaluation to exclude TB disease, 8 (4%) were diagnosed with LTBI, and all had the recommendation to start TPT. Only 3 (1.5%) completed the treatment. Having the first contact with primary care for perinatal care was significantly associated with lower odds of LTBI testing among women (OR = 0.063; 95% CI: 0.014–0.281; $p < 0.001$).
Conclusions: The cascade of care of TBI in this primary care setting was very low. Identifying opportunities to support primary care providers in testing for TB infection and follow-up on TPT could meaningfully improve completion rates.

OA27-361-21 Lessons from occupational screening for TB disease using chest radiography in health workers in South Africa

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Background and challenges to implementation: Despite recommendations for occupational health worker (HW) screening for tuberculosis (TB) disease, implementation remains limited. Given high population-level rates of asymptomatic TB, symptom-based screening alone is insufficient. Furthermore, better understanding of HW perspectives is needed to address screening implementation barriers.
Intervention or response: Nested within a study on TB infection in HWs, we implemented an occupational TB disease screening programme among 149 HWs (120 females, median age 27 years, median clinical experience 2 years) at two tertiary hospitals in Cape Town, South Africa. HWs included doctors (n=56), nurses (n=50), allied health and support staff (n=43) without a prior TB history who underwent symptom screening and chest radiography (CXR). A subset (n=12) participated in semi-structured interviews, analysed using the Constrains, Actions, Risks, and Desires (CARD) framework.

Results/Impact: 125 HWs completed baseline CXR screening, with 12 CXRs (10%) reported as abnormal, of which 6 were lung-related and 6 non-pulmonary (Figure). None were diagnosed with TB by sputum Xpert or culture. Abnormal CXRs were reviewed and repeated or referred. HWs acknowledged TB exposure as part of their work environment but did not consistently use protective measures like N95 respirators. They highlighted common delays in diagnosing patients with TB related to systemic constraints that increased HW risk. While not all HWs were able to complete baseline CXR screening, others found doing it at their place of work was a facilitator. HWs appreciated occupational TB screening, while recognising budget constraints for such programmes.

Chest radiography in occupational TB screening: results and HW experiences

Abnormal chest radiographs: 12/125	
Lung abnormalities	**Other abnormalities**
Hilar lymphadenopathy[1]	Increased cardiothoracic ratio[1]
Patchy airspace opacification[1]	Incidental hiatus hernia[1]
Small pleural effusion with atelectasis[1]	Breast nodule[2]
Coarse peribronchovascular markings[1]	Supraclavicular soft tissue abnormality[1]
Right middle lobe opacification[2]	Diaphragmatic nodule[1]
Small airways disease[3]	Rib notching (concern for coarctation)[2]
[1]Sputum Xpert Ultra negative *[2]Resolution on repeat Xray* *[3]Referred to pulmonologist*	*[1]Reviewed and not thought to be significant* *[2]Referred for medical evaluation*

Health workers' views on occupational TB screening	
C ♣ Constraint	*[should occupational screening for TB be available to health workers?] Yes, if it's within a budget that is feasible for our country.* *I think the chest X-ray has been the thing I've struggled most with, to actually it get done.*
A ♦ Action	*In the acute admissions ward, the patients come in with anything and everything, so the probability of TB is there, but it was never such a cause for anxiety that I thought of wearing a N95 mask.* *I didn't know what to expect when I saw the result of the chest x-ray, obviously I don't know how to read it, so I rely a lot on the report.*
R ♠ Risk	*I've come into contact with so many TB patients. They weren't supposed to have TB, but they ended up having TB. They came in for shortness of breath or for asthma. Turns out they had TB.* *I do think it [TB screening] made me more aware of the fact that I am at risk for TB. The fact that I was continuously screened did bring that to the front of my mind that listen, I am at risk, I could be infected at any point.*
D ♥ Desire	*It was nice that it [occupational TB screening] was available, the CXR and then also the GeneXpert. Because we are exposed everyday.* *…because you work here, it's a lot easier to just pop in when you have an hour at lunch, you just quickly do your X-ray.*

Conclusions: Occupational TB screening using CXR was feasible in our setting. Despite the low yield of TB disease, 10% had abnormal CXRs requiring review, highlighting the potential benefits and challenges of screening asymptomatic HWs. Occupational health services must be equipped to interpret and manage these findings, with clear referral pathways.

This study provides practical insights into the design and resourcing needs for scaling up occupational TB screening.

OA27-362-21 Evaluating TB treatment outcomes among healthcare workers in Zambia (2018–2022): A key strategy for enhancing healthcare workers' safety

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Background and challenges to implementation: Healthcare workers (HCWs) face a heightened risk of contracting tuberculosis (TB) compared to the general public, primarily due to increased exposure and inadequate infection control measures. Prompt identification and treatment of TB among HCWs not only safeguard their quality of life but also prevent adverse outcomes, including mortality. In 2018, Zambia launched a nation-wide bi-annual TB screening programme for HCWs, which included symptom and X-ray screening and sputum examinations utilizing GeneXpert and other rapid diagnostic tools. We assessed the TB treatment outcomes in HCWs diagnosed with TB over five years from 2018 to 2022.

Intervention or response: An evaluation of the TB treatment outcomes of HCWs diagnosed with TB from 2018 to 2022 was conducted using a structured cohort analysis approach. Potential factors affecting successful TB treatment were identified through a comprehensive review of treatment records, analysis of routine programme data, and consultation with healthcare workers. Root cause analysis used structured interviews and field observations to explore factors contributing to treatment outcomes.

Results/Impact: 594 HCWs were enrolled in TB treatment over five years, achieving a treatment success rate of 95% (566/594). Among those successfully treated, 35% were declared cured, while 60.4% (360/565) completed their treatment.

Unfavorable outcomes occurred in 5% (28/594) of cases, with 79% (23/30) of these resulting in death before treatment completion. Although patients had known physical addresses, follow-up was hindered by stigma and privacy concerns, leading to some cases being lost to follow-up (LTFU) or not evaluated.

Conclusions: Although the overall treatment success rate among HCWs was high, the findings highlight the need to address gaps in care, particularly about mortality and LTFU. To address gaps, targeted strategies are needed to enhance treatment adherence, TB Preventive Treatment (TPT), and robust workplace infection prevention and control measures.

Additionally, understanding the extent of stigma and discrimination among HCWs requires further study.

OA27-363-21 TB preventive treatment among health workers in Pakistan: Cross-country comparison of outcomes and gaps

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Background: Health care workers (HCWs) are at significantly higher risk of tuberculosis (TB) infection due to their frequent and prolonged exposure to TB patients, especially in settings with inadequate infection prevention and control (IPC) measures. While global guidelines strongly recommend TB preventive treatment (TPT) for HCWs, studies consistently report low uptake and poor adherence.
Design/Methods: An interventional study titled "Prevent TB to End TB Project", under the TB REACH initiative, was implemented across 61 health facilities in nine districts of Pakistan. HCW, along with other high-risk groups, were screened using symptom assessment and chest radiography.
After ruling out active TB, eligible HCWs were offered rifapentine-based short-course TPT regimens. Data were analyzed to assess TPT initiation and completion rates among HCWs.
In addition, a literature review was conducted to compare uptake and programmatic outcomes from similar interventions in other countries.

Country	Period	Uptake	Completion	Regimen	Key Barriers
Pakistan	2023-24	63%	98%	3HP	Moderate hesitancy, logistical gaps, side effect concerns
India	2022-23	0.9%	Not Mentioned	3HP	Low awareness, side effect concerns
China	2022	Low	Not Mentioned	6H	Attitude–action gap, side effect concerns
Indonesia	2022	Not reported	Not Mentioned	6H	Limited TPT data despite high LTBI burden
Russia	N/a	Not reported	Not Mentioned	Not Mentioned	Risk desensitization among HCWs, Low awareness,
South Africa	2021-22 (Eswatini)	21%	Not Mentioned	6H	Role ambiguity, weak accountability mechanisms, Low awareness,
Phillipines	2018-20	2%	Not Mentioned	6H	Systemic implementation bottlenecks, Low awareness,
Kenya	2022	Does not mention how many in total were offered - Initiated in 14,948 HCWs	80%	6H	Delayed outcome tracking, adverse events

Table.

Results: Out of 1,101 eligible HCW screened in Pakistan, 63% initiated TPT, and among these 98% successfully completed treatment. High treatment-compliance was attributed to short course, close follow up and digital tracking systems.
In contrast, comparative data from India, China, Indonesia, Russia, South Africa, the Philippines, and Kenya revealed significantly lower TPT uptake among HCWs or limited programmatic reporting.
Common barriers identified across these settings included limited awareness, unclear implementation responsibilities, the use of longer-duration regimens, and weak follow-up mechanisms.
Conclusions: TPT implementation for HCWs in Pakistan demonstrates high adherence and feasibility in resource-limited settings. However, the suboptimal-uptake highlights persistent challenges, including risk perception, hesitancy due to uncertainty about TPT effectiveness amid ongoing-exposure, and logistic constraints.
Comparative insights from Kenya, where national TPT scale-up also achieved high completion-rates, further underscore the importance of simplified regimens and robust follow-up systems. For broader impact, TPT should be integrated into occupational-health programs, backed by policy frameworks and targeted education to ensure the protection of frontline health workers.

OA27-364-21 Feasibility and acceptability of chest X-ray with computer aided detection (CAD) among health care workers

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Background: Tuberculosis (TB) is a significant global health threat, with 10.6 million cases and 1.3 million deaths in 2022. Computer-aided detection (CAD) software can interpret chest X-rays (CXR) with accuracy equal to or greater than human readers, offering an opportunity to improve TB detection and treatment. This study assessed the feasibility and acceptability of CAD-CXR among healthcare workers in Abuja, Nigeria.
Design/Methods: This study employed a phenomenological qualitative research approach with purposive sampling to gather in-depth insights. Five key informant interviews were conducted with healthcare workers in

Abuja, and one focus group discussion was held with nine participants from the START4ALL project. Participants provided verbal and written informed consent before sharing their experiences through in-depth interviews guided by a structured guide. The emerging themes were organized and presented using the Consolidated Framework for Implementation Research (CFIR). The data was analyzed using thematic analysis to identify patterns and meanings.

Results: Findings from this study revealed a high Feasibility for CAD chest X-ray where most respondents reported that it's a screening tool for TB, gives result in real time and reduces man power but challenges existed for funding. Acceptability was high where most participants reported that it helps to find asymptomatic TB, widely acceptable and reduces cost of molecular diagnosis as it identifies presumptive for TB, but few respondents reported that data privacy should be ensured and a need for second reader.

S/N	Theme	Subtheme	Feasibility	Theme	Subtheme	Acceptability
			It's a screening tool for TB			Helps us to find Asymptomatic TB
						Highly sensitive
1	Intervention characteristics	Perceived value and effectiveness	It gives confidence because it gives result in real time	Affective Attitude	Perceived value	It is needed most especially in children and adults that can't produce sputum due to one health condition or the other
			Revolutionized both screening and not only TB. It can be used to diagnose other lung disease as well as cardiovascular diseases			
						It is widely acceptable
2	Resources	Human and material resources	Reduces manpower, because the AI does not require a radiologist to interpret result.	Burden	Time/ resource demand	Reduces the cost of the use of molecular diagnosis, it trims your presumptive
		Availability of funding	Challenges exist in funding			
3	Contextual fit	Alignment with national health policies	Guideline and SOPs developed	Ethicality	Fairness and appropriateness	Ensure Privacy of Data
					Trust in intervention	High Confidence, gives result in real time.
4	Adaptability	Scalability	Continued Advocacy	Perceived effectiveness	Believe in achieving outcomes	Requires a second reader to reduce error

Conclusions: This study demonstrates the feasibility and acceptability of CAD-CXR among healthcare workers in Abuja, Nigeria. The findings suggest that CAD-CXR has the potential to improve TB detection and treatment outcomes, aligning with the Sustainable Development Goals aimed at eliminating TB by 2030.

OA27-365-21 Standards behind bars: Review of TB policies for incarcerated populations in six countries

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Background: Incarcerated populations face a disproportionately high burden of tuberculosis (TB) due to structural inequalities. Despite global commitments to ending TB, national TB policies within prisons remain inconsistent.

This study examines the state of policy for incarcerated populations in six TB high-burden countries.

Design/Methods: The study analyzed national TB-related policies for incarcerated populations in six high-burden countries: three in Eastern Europe and Central Asia (EECA) (Tajikistan, Moldova, Ukraine) and three in Africa (Nigeria, Zimbabwe, Kenya).

A desktop review of Ministry of Justice and Ministry of Health documents was conducted. Key information was extracted and categorized based on alignment with World Health Organization (WHO) standards for TB care in prisons.

Results: Preliminary results suggest that prison occupancy exceeds 100% in all three African countries, while occupancy in EECA countries remains below capacity. Most countries lack clear TB-related nutrition guidelines, except Moldova and Tajikistan, where food norms vary by health status. In Moldova, nutritional support for TB is provided in line with legal norms.

TB screening practices differ: Zimbabwe, Kenya, and Nigeria rely on symptomatic screening, while Tajikistan, Moldova, and Ukraine conduct routine screening at entry; Moldova and Tajikistan also screen periodically and at release. Moldova uses Mantoux testing where X-rays are unavailable.

Equal standards of care for TB are guaranteed as a matter of policy in Nigeria, Tajikistan, and Moldova, including for pre-trial detainees. Nigeria applies the same TB and TB/HIV co-infection protocols to the incarcerated population as to the general population. Moldova and Ukraine have structured post-release care; Tajikistan, Kenya, Zimbabwe, and Nigeria require medical clearance but lack detailed continuity-of-care plans.

Conclusions: Though the sampled EECA countries demonstrate more comprehensive TB care compared to their African counterparts, suggesting regional disparities between the EECA and African regions, the findings highlight an overall lack of focus on TB care in prison policies.

OA27-366-21 Human rights-based and inmate-led TB prevention and care in prisons

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Background and challenges to implementation: Tuberculosis (TB) is the main cause of death in Zambian correctional facilities with a prevalence 3.5 times the national estimate (researchgate.net/ publication/354886831). Factors such as extreme over overcrowding, poor ventilation, sanitation and hygiene, lack of isolation cell, high inmate mobility between facilities, and poor nutrition value of food contribute to high TB burden. TB screening, diagnosis and treatment remains inconsistent, largely due to limited TB knowledge among prison staff and lack of health staff.

Therefore, Development Aid from People to People (national NGO) conducted a peer led model supporting the screening, diagnosis, treatment and care for persons with TB (PWTB).

Intervention or response: DAPP piloted a peer-driven, inmate-centered model across four Correctional Facilities. Grounded in a rights-based and person-centered approach, trained inmate peer educators delivered continuous TB education, anti-stigma campaign, supported routine screening including on entry, and promoted drug availability and adherence.

Symptomatic inmates received diagnostic via various testing methods. DOT adherence groups consisting of three inmates on TB treatment enhanced adherence and psychosocial support. Food gardens were established. Infection control included ventilation, PPE use, and sanitation. Weakened inmates got light work duty.

Improved system for inmates on transit and aftercare counseling prepared the inmate family for providing TB adherence support.

Results/Impact: From May 2023 to March 2025 in 4 correctional facilities, 4,443 new entrant inmates were screened for TB, 1,106 (25.0%) TB tested, 832 received TPT and 6.5% (72/1106) inmates received active TB treatment. All four facilities reported no new cases of TB disease at end of project.

In one facility the year before, 73% (11/15) of those on TB treatment had poor adherence.

During the intervention phase, treatment adherence changed to 100%. There was acceptance of the model by correctional facility authorities.

Districts in Eastern province, Zambia	Nyimba	Petauke	Chipata	Katete	Katete & Chipata	TOTAL
Indicators / Period	May 24 - Mar 25	May 24 - Mar 25	May 24 - Jan25	May 24 - Mar 25	May 23 - April 24	May 23 - March 25
# of inmates with active TB	21	2	9	6	51	89
# of new entrant inmates screened for TB at entry-point (within 48 hours)	0	389	1599	611	1844	4443
# of inmates tested for TB from screening process	436	90	0	580	0	1106
# of inmates diagnosed TB who started TB treatment	8	2	8	0	45	63
# of routine TB screenings of inmates were conducted in the reporting period	30	166	721	41	0	958
# of sputum samples collected, taken to lab and got back result to inmate	34	90	0	117	1326	1567
# of inmates on TB prevention (TPT) in the previous reporting period who completed therapy	128	51	0	51	0	230
# of TRIOs (small DOT adherence & support groups) formed	31	4	6	30	24	95

Conclusions: Inmate led model of TB screening and treatment support was found to improve case finding and reduce poor adherence.

OA27-367-21 Enhancing TB prevention and care as well as early diagnosis in Zambia's correctional facilities: The Building Bridges Model

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Background and challenges to implementation: Zambia's correctional system is prone to TB transmission, causing a public health crisis affecting inmates and posing a broader risk to community health. Zambian correctional facilities are becoming breeding and incubating grounds for TB due to risk factors like overcrowding, poor ventilation, late case detection, poor nutrition, poor health services, high prevalence of HIV and lack of TB screening.

Intervention or response: IN BUT FREE with support from LHL International has been implementing a TB programme called Building Bridges in 13 Zambian cor-

rectional facilities. The project covers over 10,000 prisoners and 1,336 correctional officers. The main goal of the project is to promote the prevention and control of TB and HIV in Zambian correctional facilities using a partnership of actors.

Activities conducted include advocacy for improved prison health, capacity building for the correctional officers and inmates to respond to TB, HIV, TB screening, nutrition support, cell awareness meetings, development of IEC materials and TB surveillance.

Results/Impact: Between 2021-2024, the intervention established a TB Working Group, trained 1,424 inmates as Peer Educators, 58 Psychosocial Counsellors, 241 officers as TB treatment supporters, hosted 3 advocacy meetings, produced and distributed 1,210 IEC materials, strengthened drama groups to promote TB awareness, 25,152 weekly cell awareness sessions conducted, identified and referred 22,392 presumptive cases, of which 487 (2,17%) inmates were diagnosed with TB and started on treatment and supported throughout treatment.

Provided nutrition support to 6,341 inmates, provided hygiene packs to 3,413 TB patients and peers, supplied basic medical equipment to support patient monitoring, linked 56 discharged inmates on TB treatment to nearest clinics and initiated Infection Prevention and Control committees at each facility.

Conclusions: Building bridges is an innovative intervention which can significantly contribute to improved TB prevention and control practices and ultimately reduce TB transmission in correctional facilities.

OA27-368-21 Effectiveness of latent TB infection treatment among individuals in correctional facilities, Taiwan

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Background: Taiwan has a moderate tuberculosis (TB) burden, with the incidence of 28 cases per 100,000 population in 2023. Since 2015, the WHO has recommended LTBI diagnosis and treatment for priority populations including inmates, to help achieve the End TB target. Since 2019, Taiwan CDC has collaborated with the Agency of Corrections to provide tuberculosis preventive therapy (TPT) in correctional facilities.

Design/Methods: We conducted a retrospective cohort study enrolling inmates and staff in correctional facilities from 2019 to 2024, analyzing TB incidence among LTBI-positive individuals stratified by receiving TPT or not followed up until September 6, 2024. We collected demographic characteristics and used the Cox proportional hazards model to evaluate the effectiveness of TPT.

Results: Among the 3,794 LTBI-positive inmates and staff, 3,182 (83.9%) initiated TPT. Twenty cases of active TB were identified during the median follow-up period of 41.5 months (IQR: 18.4–43.5), with an overall incidence rate was 190.6 per 100,000 person-years. The most common selected initial TPT regimen were 3HP (55.2%), followed by 1HP (26.2%) and 9H (10.0%), with 80.4% of participants who initiated TPT completing treatment. The highest completion rate among the initial TPT regimens was observed in the 1HP group (85.6%).

Multivariate analysis showed that individuals who did not receive TPT had a significantly higher risk of developing active TB disease (aHR=15.34, 95% CI: 5.76-40.89) compared to those who received treatment (*Table 1*).

No significant differences of TB risk were observed based on sex, age group, type of correctional facility, or individual previous TB contact history.

	No. of TB	Person-year	Incidence rate per 100,000	Univariate	Multivariate
				HR (95% CI)	aHR (95% CI)
LTBI Status					
No TPT	14	1449.5	965.9	14.77 (5.67-38.44)	15.34 (5.76-40.89)
Received TPT	6	9045.6	66.3	1	1
Gender					
Male	16	9354.3	171.0	1	1
Female	4	1140.8	350.6	2.12 (0.71-6.34)	3.24(1-10.57)
Age Group					
≤60 yrs	13	8452.7	153.8	1	1
>60 yrs	7	2042.3	342.7	2.25 (0.9-5.65)	1.84 (0.73-4.66)
Facility Type					
Prison	18	9931.3	181.3	1	1
Others	2	563.8	354.7	1.55 (0.34-7.02)	1.57 (0.34-7.2)
Identity					
Inmates	18	9974.9	180.5	1	1
Staff	2	520.2	384.5	2.16 (0.5-9.3)	0.90 (0.19-4.26)
TB Contact History					
Yes	6	2818.9	212.9	1.19 (0.46-3.1	1.36 (0.51-3.64)
No	14	7676.2	182.4	1	1

Abbreviation: HR, hazard ratio; aHR, adjusted hazard ratio; LTBI, latent tuberculosis infection; TPT, tuberculosis preventive therapy

Table 1. Risk of active TB among individuals eligible for TPT in correctional facilities (N=3,794)

Conclusions: TPT significantly reduces TB risk in correctional facilities. Individuals who did not receive TPT had more than a 15-fold increased risk of developing active TB compared to those who underwent treatment, highlighting the critical role of preventive therapy in correctional facilities.

OA28 Lung health in children and adolescents

OA28-369-21 Challenges and stethoscope preferences among healthcare workers in diagnosing paediatric pneumonia: A qualitative study in South Africa

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Background: Pneumonia is a leading cause of death in children (<5 years of age) in low- and middle-income countries (LMICs). Lung auscultation using conventional stethoscopes is valuable for diagnosis, however, implementation challenges exist. We explored healthcare workers' experiences of traditional stethoscopes and preferred future designs for paediatric use.
Design/Methods: We conducted in-depth qualitative interviews with 9 HCWs (4 doctors, 2 nurses, and 3 medical interns) from January to February 2025 at a tertiary hospital in Cape Town, South Africa. We also conducted unstructured think-aloud activities where HCWs verbalized their thoughts on workflow and drew preferred stethoscope designs.
We purposively sampled HCWs who routinely use stethoscopes on children by profession, age, and sex. We compiled comprehensive case descriptions with illustrative excerpts from the interview audio-recordings and applied deductive qualitative thematic analysis methods.
Results: The HCWs' experiences with stethoscopes depended on children's reactions, work environment, and medical device features. HCWs stated that while stethoscopes are user-friendly, they require subjective, high-skill interpretation for accurate diagnosis. HCWs noted challenges, including that children were intimidated by chest auscultation, and they struggle to clean stethoscopes between patients. HCWs identified potential solutions to the challenges of conventional stethoscopes, including visually appealing designs with colours, floral patterns, and animations, to help provide distraction and minimize intimidation. HCWs also suggested electronic enhancements more consistent with digital stethoscopes, like automated noise cancellation, artificial intelligence (AI) algorithms for sound interpretation and respiratory rate calculation (*Figure 1*).

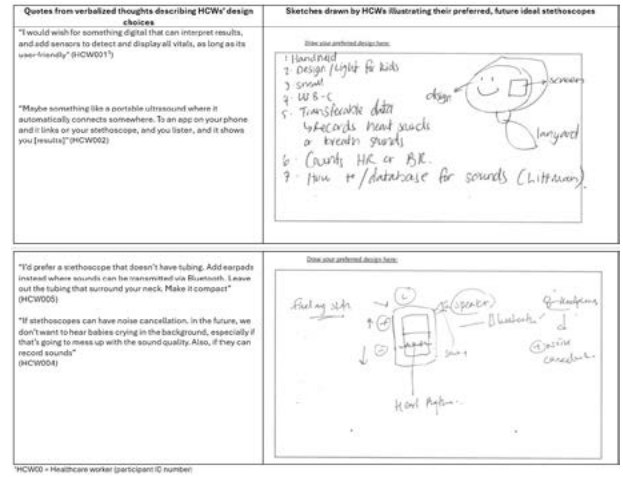

Figure 1. Healthcare workers' recommended stethoscope future designs.

HCWs reported that they would prefer a tubeless design that electronically transmits sounds by Bluetooth to earphones, alleviating the need to carry stethoscopes around their necks.
Conclusions: Future stethoscope designs should be child-friendly, enhance hygiene, and include AI features like auscultation interpretation to aid paediatric respiratory diagnosis.

OA28-370-21 Evidence synthesis: RSV burden and the future of respiratory infection surveillance in Pakistan

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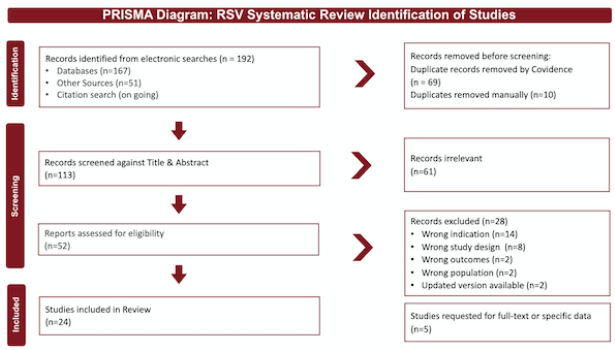
Background: Respiratory syncytial virus (RSV) has been identified as the leading cause of respiratory infections in South Asian infants, however there is insufficient country-specific evidence to support the introduction of a maternal vaccine to protect children and pregnant women. In this study, we will scope evidence to identify in-country surveillance systems and systematically evaluate literature to quantify RSV disease burden in Pakistan.
Design/Methods: A systematic review to estimate the burden of RSV in pregnant women and children under-5 years from country-specific primary studies would be conducted in accordance with PRISMA guidelines.

Search strategies will be utilised to extract published data and grey literature from electronic databases (PubMed, Web of Science, Cochrane Library, Global Index Medicus, Embase, Medline, Scopus, CINAHL, Pak Medi-net) from inception to December 2024. A scoping review will be undertaken following PRISMA-ScR guidelines to map in-country data sources from peer-review publications, grey literature and expert consultation. Independent reviewers will extract data, and do quality assessments to report pooled prevalence estimates, and conduct meta-analysis. Covidence will be used for data management of all reviews.

Results: Data extraction is currently in-process. For RSV we have shortlisted 24 studies for extraction, all are on children. Only 4 studies report on RSV subtypes, with predominant RSV-A cases. Most studies are short term, have small sample sizes, with insufficient evidence on seasonality. On scoping evidence we have identified that RSV is occasionally tested for as part of influenza-surveillance system, from 8 sentinel sites in Pakistan, however most of the data is not yet publicly accessible.



Conclusions: This combined review estimates RSV disease burden in Pakistan and offers a thorough assessment of surveillance systems.

The findings will provide recommendations for improving monitoring systems and build a case for maternal RSV vaccine introduction in Pakistan.

OA28-371-21 Assessing acute cough in pre-schoolers through TB symptomatic screening: Insights from a five-year retrospective study

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Background and challenges to implementation: Globally, tuberculosis (TB) a leading cause of morbidity and mortality among pediatric population with about 30% among persons with TB who died in 2023. Diagnosing and treating TB in children is difficult due to nonspecific symptoms, delaying diagnosis and treatment.

Dubiety among healthcare providers, caregivers, and parents about childhood coughs leads to increased consultations, follow-ups, and antibiotic use, particularly in developing countries like Nigeria.

This study aims to assess acute cough in preschoolers through TB symptomatic screening.

Intervention or response: This retrospective study on KNCV Nigeria's ongoing efforts to enhance early detection of tuberculosis (TB) through active case finding in health facilities across the country.

These activities are carried out by trained medical and healthcare personnel who conduct systematic screening of clients for TB-related symptoms, with particular focus on cough duration. Data from KNCV Nigeria's TBLON project (May 2020-January 2025) in Anambra, Delta, and Imo states.

The study focused on children aged 0-4 years, examining the number screened, cough duration, and TB diagnoses and referred for further evaluation. The analysis was performed using descriptive statistics.

Results/Impact: A total of 363,544 children under the age of five were screened for tuberculosis (TB). Among them, 2,909 children showed signs of a cough lasting less than two weeks—an early symptom that can sometimes be overlooked.

Out of this group, 65 children were diagnosed with TB, highlighting that roughly 1 in every 45 symptomatic children tested positive. This translates to a TB detection rate of 2.23%.

Category	Count	Percentage (%)
Children screened (0–4 years)	363,544	100%
With cough < 2 weeks	2,909	0.8%
Confirmed TB cases in this group	65	2.23% (of 2,909)

Table 1. Data Summary.

Conclusions: A small fraction of the 0–4-year-old cohort (2,909 of 363,544) presented with cough of less than two weeks, the TB detection rate within that group reached approximately 2.23%.
These findings underscore the clinical importance of screening for tuberculosis among young children, even in cases of relatively short-duration cough, to facilitate prompt diagnosis and timely intervention.

OA28-372-21 Assessing lung function impairment in children and adolescents post-TB treatment: Case of Mama Lucy Kibaki Hospital

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Background and challenges to implementation: Post-tuberculosis lung disease (PTLD) is increasingly recognized as a cause of long-term respiratory morbidity, especially in children and adolescents. Patients with PTLD may present with persistence of symptoms or decline in lung function despite successful completion of treatment or cure. Increasing evidence of long-term respiratory complications following TB in a proportion of these patients affecting their quality of life
- Over 60% of patients still have symptoms after completion of TB treatment
- Over 80% have radiological sequalae
- Over 30% have spirometry function test abnormalities and more than 40% have bronchiectasis

Intervention or response: This study assessed lung function outcomes among pediatric TB survivors from 2022 and 2023 using spirometry and the 6-minute walk test (6MWT).
Children and adolescents who had completed pulmonary TB treatment were identified from facility registers, and caregivers were contacted for participation. The healthcare workers including clinicians were sensitized on the study.
Upon obtaining consent, spirometry was performed to assess obstructive and restrictive impairments, while the 6MWT evaluated functional capacity via exertional oxygen desaturation (≥3%).
Results/Impact: There were a total of 55 participants that were enrolled.
Spirometry abnormalities: 18 children (32.7%)
- Obstructive impairment: 9 cases
- Restrictive impairment: 10 cases (slightly more prevalent)

6MWT findings: 35 children (63.6%) showed abnormal desaturation, indicating impaired gas exchange and reduced exercise tolerance despite completing TB treatment.
This supports the presence of lung impairment despite successful TB treatment
Conclusions: A significant proportion of pediatric and adolescents who had successfully completed TB treatment exhibited lung function impairment, highlighting the need for routine monitoring and exercise tolerance assessment in post-TB care in order to improve their quality of life post TB.
Due to limited infrastructure at the health facilities the 6MWT is readily available and is equally important.

OA28-374-21 The TB aftermath: Uncovering the hidden respiratory burden in children

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Background: Respiratory sequelae following tuberculosis (TB) in children may persist long-term. However, comprehensive characterization of pediatric post-TB lung disease (PTLD) remains limited.
Design/Methods: We followed children (≤15 years) who received TB treatment, in Kenya. Assessments at 6, 12, and 24 months included clinical evaluation, chest radiography (CXR), spirometry and oscillometry. PTLD was defined as presence of; persistent respiratory symptoms (wheezing, cough, or oxygen saturation <94%), abnormal CXR, or impaired lung function in children receiving TB treatment for ≥5.5 months.
We expanded this definition to include additional pulmonary function parameters: PRISM (Preserved Ratio Impaired Spirometry, (reduced Forced Expiratory Volume in one second (FEV1) or Forced Vital Capacity (FVC) with preserved FEV1/FVC ratio and oscillometry abnormalities. Correlates for PTLD were identified using a generalized linear model at each timepoint.
Results: Among 256 children treated for TB (29 confirmed, 227 unconfirmed), median age was 2.0 years (IQR 0.0-5.0) with 47.6% being male. At 6, 12, and 24 months persistent respiratory symptoms were found in 16 (6.3%), 16 (7.4%), and 6 (4.4%); impaired lung function using spirometry in 1/9 (11.1%), 6/27 (22.2%), and 3/16 (18.8%). Oscillometry abnormalities were detected in 2/3 (66.7%), 4/7 (57.1%), and 18/25 (72.0%) children at the three timepoints (*Table*), with oscillometry identifying small airway dysfunction in 4/32 (12.5%) children with normal spi-

rometry. PRISM identified 13/52 (25.0%) children with abnormal lung function. Structural abnormalities (CXR) were identified in 86 (33.6%), 45 (20.7%), and 14 (10.5%) children at the three assessment points. Overall, 69 (30.0%), 46 (21.2%), and 27 (19.6%) children had at least one post-TB abnormality at the three timepoints (*Table*). At month 12, PTLD was more common in children living with HIV (RR 2.2, p=0.027) and associated with higher weight-for-height z-score (RR 1.2, p=0.045) (*Table*).

Table : Prevalence and Risk Factors for Post-TB Lung Disease at 6, 12, and 24 Months Post-TB Treatment

PTLD prevalence	Month 6: N=69/256 (30.0%)		Month 12: N=46/217 (21.2%)		Month 24: N=27/138 (19.6%)	
	Frequency	%	Frequency	%	Frequency	%
**Respiratory symptoms	16/256	6.3%	16/217	7.4%	6/138	4.4%
**Spirometry abnormalities	1/9	11.1%	6/27	22.2%	3/16	18.8%
**Oscillometry abnormalities	2/3	66.7%	4/7	57.1%	18/25	72.0%
**PRISM abnormalities	3/9	33.3%	8/27	29.6%	2/16	12.5%
**Abnormal CXR	86/256	33.6%	45/217	20.7%	14/138	10.5%
PTLD risk factors	**Median (IQR) or N (%)**	**RR (95% CI), p-value**	**Median (IQR) or N (%)**	**RR (95% CI), p-value**	**Median (IQR) or N (%)**	**RR (95% CI), p-value**
WHZ	-0.1 (-1.4, 0.5)	1.0 (0.9, 1.2) p= 0.485	0.1 (-0.9, 0.8)	¥1.2 (1.0, 1.4) **p=0.045**	0.4 (-0.0, 0.9)	1.2 (0.8, 1.7) p= 0.334
CLHIV	13 (5.1%)	1.3 (0.7, 2.4) p= 0.639	11 (5.1%)	**¥2.2 (1.1, 4.3) p=0.027**	6 (4.3%)	1.8 (0.6, 5.5) p=0.328

Abbreviations: PTLD = Post-TB Lung Disease; RR = Relative Risk; CI = Confidence Interval; IQR = Interquartile Range; WHZ = Weight-for-Height Z-score; CLHIV = Children Living with HIV; CXR = Chest X-ray; PRISM = reduced FEV1 or FVC in the setting of preserved FEV1/FVC ratio; % = Percentage; **Abnormal spirometry:** defined as FEV1, FVC, and FEV1/FVC ratio below the Lower Limit of Normal (< -1.64 Z-score); **Abnormal oscillometry:** included R5 and R20, R5-R20, AX, and resonant frequency considered abnormal when exceeding the Upper Limit of Normal; **PTLD:** defined as any abnormal clinical, radiological, or pulmonary function finding at each assessment timepoint, in children receiving TB treatment for ≥5.5 months; ¥Statistically significant at p<0.05

Conclusions: Respiratory sequelae persist in children post-TB, with oscillometry detecting abnormalities missed by conventional assessment.

OA28-375-21 Bidirectional screening approach for TB and pertussis: Lessons learnt from West Bengal, India

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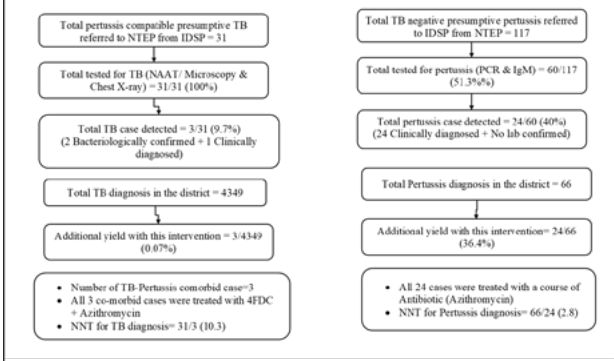
Background and challenges to implementation: Since 2015, the Government of India is conducting pertussis surveillance in the country as a part of Integrated Disease Surveillance Project (IDSP). A person with a cough lasting at least two weeks with at least one of the following symptoms- paroxysms of coughing, inspiratory "whooping", post-tussive vomiting without other apparent cause is considered as a presumptive pertussis and nasopharyngeal swab & blood is collected for laboratory confirmation. On the other hand, under National TB Elimination Program (NTEP), sputum is collected & tested form individuals with ≥2 weeks of cough for TB diagnosis. Over the last decade, both the disease surveillance activities are happening in the health care facilities of West Bengal, but in silo.

Intervention or response: In 2024, South 24 Parganas district of West Bengal devised a cross-referral system of bi-directional screening of TB & pertussis. All those who are presented with cough for ≥2 weeks and sputum is negative for TB, are systematically referred from NTEP to IDSP for pertussis test. On the other hand, all pertussis compatible cases are also sent by IDSP to NTEP for ruling out TB.

Results/Impact: Since January'24 till March'25, total 117 person were referred to IDSP from NTEP. 60 evaluated for pertussis. Though none was laboratory confirmed, 24 were diagnosed as 'Pertussis compatible' followed by the public health actions in the respective households.

On the other hand, total 31 cases were referred to NTEP from IDSP. Total three person with TB diagnosed. All three were TB-Pertussis co-morbid case. **(Fig-1)**

Figure 1: Flowchart depicting the number and percentage of participants at different stages of bidirectional TB-pertussis screening at South 24 Parganas district of West Bengal during Jan'24-Mar'25



Notes: - TB= Tuberculosis, NTEP= National TB Elimination Program; IDSP= Integrated Disease Surveillance Program; NAAT= Nucleic Acid Amplification Test; PCR= Polymerase Chain Reaction; IgM= Immunoglobulin type M (indicated recent infection); 4FDC = Fixed Dose Combination of four 1st line Anti-TB Drugs; NNT= Number needed to Test (to get 1 diagnosed case)

Conclusions: TB pertussis co-exists. Presenting symptom can be very similar. Screening & testing of both the diseases can be arranged in an integrated way. Though the additional yield for NTEP was negligible but for IDSP it was significant. The West Bengal model of bidirectional TB-pertussis screening may be replicated in other endemic areas.

OA28-376-21 The performance of CAD4TB to distinguish radiological TB from not-TB in a paediatric population in South Africa

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Background: Computer-aided detection (CAD) of chest x-ray (CXR) offers possibility to support access to TB diagnosis in children. However, existing CAD algorithms have been largely trained on adult data and are not recommended for use in those under 15 years by the World Health Organization. Despite this, CAD is being used in children, and it is crucial to understand its performance in paediatric populations. We evaluated the performance of several CAD4TB algorithms to identify radiological TB on paediatric CXRs.
Design/Methods: We used 491 frontal digital CXRs from children aged 0-13 years who were enrolled into a TB diagnostic cohort study with a reference standard of "radiological TB" as classified by consensus between 2 expert human readers. A receiver operating curve (ROC) analysis was performed using output from three CAD4TB software versions: commercially available CAD4TB V6 and V8 and a CAD4pTB (a research model developed by retraining CAD4TB V7 for paediatrics with 445 CXR images from children).

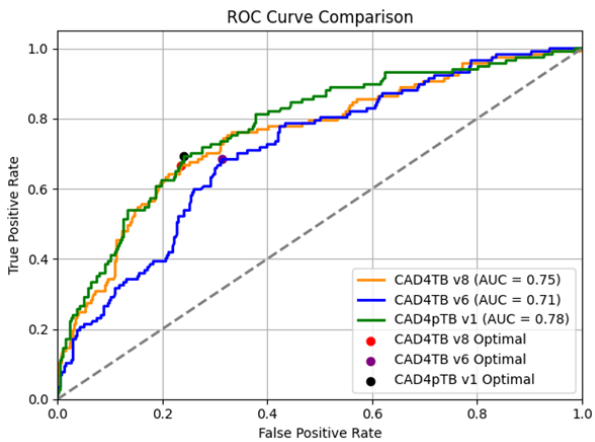

Figure 1. Receiver operating characteristic curves comparing the performance of different CAD4TB models to distinguish between TB and not-TB against the radiological reference standard of a consensus human read chest x-ray.

Results: The area under the receiver operating characteristic curve (AUC) of the CAD4TB V6, CAD4TB V8 and CAD4pTB models were 0.71, 0.75 and 0.78 respectively (Fig 1) and, at a fixed specificity of 90% the sensitivity of each was 28%, 33% and 39%.
Conclusions: This analysis provides the first external validation of the CAD4pTB model. The improved performance of the CAD4pTB model compared to the other CAD4TB models, after retraining with a small paediatric CXR set, is promising for the success of future paediatric CAD development.

OA28-377-21 AI-enabled X-ray for childhood TB detection: Early implementation results from school-based TB screening activities in remote rural communities in Nigeria

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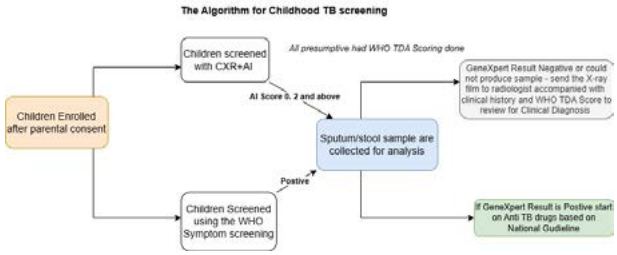
Background and challenges to implementation: Tuberculosis (TB) remains a global public health challenge, with children under 15 years contributing approximately 12% of the total TB burden. Pediatric TB is frequently underdiagnosed due to non-specific symptoms, difficulty in obtaining sputum, and its paucibacillary nature. These challenges are more pronounced in high-burden countries like Nigeria.
This study presents early findings from school-based TB screening activities using AI-enabled chest X-ray technology to for childhood TB screening in remote Nigerian communities.
Intervention or response: Caritas Nigeria conducted mobile X-ray and AI-assisted active case finding (ACF) in six schools from January to March 2025 across three remote LGAs in Ebonyi State—Ikwo, Ishielu, and Izzi. Using qXR v4.2 (Qure.ai), AI-assisted pediatric chest X-rays, children were screened with parental consent. Those with TB symptoms or AI scores ≥0.2 were referred for GeneXpert testing. WHO treatment Decision Algorithm (TDA) scoring was administered to all identified presumptive TB cases. Q-Track facilitated data capture and care coordination, while children with negative GeneXpert results or unable to provide sputum had their X-rays, clinical history, and TDA scores reviewed by a radiologist for clinical diagnosis.
Results/Impact: A total of 697 children (mean age 9.6 ± 3.18 years; 48% female) were screened across 6 schools. Of these, 664 (95%) underwent dCXR+AI screening; 111 (16%) reported TB symptoms, and 23 (3%) were flagged with AI scores ≥0.2. Sputum or stool samples were obtained from 76 children (11%), of whom 13 (2%) tested positive for TB using GeneXpert. An additional 20 X-rays

with clinical histories and TDA Scores were reviewed by a radiologist, leading to 3 further clinical TB diagnoses. All 16 confirmed TB cases (2%) were initiated on treatment. The number needed to screen (NNS) to detect one TB case was 44



Conclusions: AI-enabled chest X-ray has shown potential in enhancing pediatric TB screening and improving childhood TB detection.

OA28-378-21 Feasibility, tolerability, and yield of nasopharyngeal aspirate and stool samples for molecular TB detection in children with severe pneumonia

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Background: Tuberculosis is common and challenging to diagnose in children with severe pneumonia. Use of nasopharyngeal aspirates (NPA) and stool samples could enhance microbiological diagnosis. We sought to assess their feasibility, safety, yield, and tolerability, amongst children with severe pneumonia.

Design/Methods: This was a nested, cross-sectional substudy within the TB-Speed Pneumonia trial enrolling children admitted with severe pneumonia from 15 hospitals in six countries who underwent systematic tuberculosis screening with NPA and stool collection tested using Xpert MTB/RIF Ultra (Ultra).
Study nurses reported on the feasibility and safety of NPA collection by questionnaire, and assessed tolerability as a before/during NPA discomfort/distress/pain score (/10) using the FLACC (Face/Leg/Activity/Cry/Consolability) scale.
We analysed endpoints using proportions and median (IQR) and examined factors associated with reduced NPA tolerability using uni/multivariable linear regression.
Results: Of 542 children enrolled, 541 (99.8%) and 423 (78.0%) had successful NPA and stool collection, respectively ($p<0.0001$). Nurses reported difficulty in child management or NPA procedure in <5% of children and minor digestive, heart-rate deceleration or dyspnoea in <5% of children; 130 (24%) children had bloody NPA sample.
Valid Ultra results were obtained on 529 (97.6%) NPA and 409 (75.5%) stool samples; 8 (1.5%) children had positive Ultra on any sample, including 8 (1.5%) on NPA, and 3 (0.6%) on stools ($p=0.13$). The median discomfort/distress/pain score increased by 3/10 [IQR 0-4] points during NPA.
Nurse-reported difficulty in NPA procedure was associated with a 0.991 (95%CI 0.068–1.918, $p<0.001$) increase in the discomfort/distress/pain score (poorer tolerability), even after adjusting for institution, child age, sex, nutrition, and HIV status.
Conclusions: NPA and stool are feasible and tolerable microbiological sampling strategies in children with severe pneumonia. NPA had a higher uptake than stool when tested with Ultra, and was associated with a modest, transient discomfort/distress/pain increase for children with minimal adverse events.

OA29 Equity at the doorstep: Community health workers for lung health

OA29-379-21 Strengthening community health workers' engagement in TB prevention and care in Madagascar: Recommendations from the workforce themselves

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Background: Community health workers (CHWs) play an essential role in tuberculosis (TB) prevention and control in Sub-Saharan Africa, yet their effectiveness remains limited in many countries. In Madagascar, a low-income setting, their engagement is substantially limited due to systemic challenges and a lack of evidence-based prioritization of CHW needs. Direct input from CHWs - main actors at the community level and those directly affected - is an important yet often neglected source of evidence in policy design. This study addresses this gap by presenting recommendations from CHWs themselves on how to strengthen their engagement in TB.
Design/Methods: This qualitative component, part of a larger mixed-methods study, was conducted in two regions (Analamanga and Atsimo-Andrefana) through five focus group discussions with CHWs, purposively sampled from health facilities selected via cluster sampling. Topic guides explored CHW recruitment practices, work environment, perceived roles, motivation, volunteering, incentives, and other factors influencing engagement. Data were collected from September to October 2024 and analyzed using inductive reflexive thematic analysis in NVivo, guided by an evolving codebook.
Results: CHWs' recommendations revealed five key areas to enhance their engagement and effectiveness in TB prevention and control:
1. Consistent financial compensation to cover work-related expenses and sustain motivation;
2. Standardized and strengthened training on TB prevention, case management, and outreach;
3. improved supervision, including performance feedback and opportunities for professional development;
4. Access to essential tools, materials, and transport for community outreach, and;
5. Recognition through formal integration into the national health system.
Background and challenges to implementation: Community health workers (CHWs) play an essential role in tuberculosis (TB) prevention and control in Sub-Saharan Africa, yet their effectiveness remains limited in many countries. In Madagascar, a low-income setting, their engagement is substantially limited due to systemic challenges and a lack of evidence-based prioritization of CHW needs. Direct input from CHWs - main actors at the community level and those directly affected - is an important yet often neglected source of evidence in policy design.
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Conclusions: Addressing CHWs' identified needs can significantly strengthen their role in TB prevention and control. Implementation research is essential to guide, adapt, and evaluate strategies, ensuring they effectively respond to public health needs.

OA29-380-21 Incentivising community action: A results-based approach to TB detection, prevention and care

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge, particularly in underserved communities where passive case-finding methods often result in missed cases, delayed diagnosis, and poor treatment outcomes. Jointed Hands Welfare Organization (JHWO), through the USAID-funded Kunda Nqob'iTB (KNTB) project, identified several challenges, including low community engagement, lack of systematic screening, and inconsistent motivation among Community Health Workers (CHWs) affecting case detection efforts.
Intervention or response: To address these barriers, JHWO implemented the Results-Based Community Active Case Finding Model (RBACFM), an incentive-driven, performance-based approach designed to enhance targeted TB screening. CHWs were assigned specific screening targets and provided with performance-based incentives to sustain motivation and accountability.
Geographic hotspot mapping was conducted to direct efforts to high-burden areas, optimizing case detection. Community leaders were actively engaged to foster trust and support screening programs, creating a conducive

environment for CHWs to operate. Routine supervision and capacity-building sessions ensured adherence to screening protocols, improving overall effectiveness.
Results/Impact: The model led to a significant increase in TB case detection. In Gweru district, presumptive TB case referrals from CHWs increased by over 450%, from 367 cases in year one to an average of 2,050 per year by year five. The presumptive TB yield improved from 4% to 21%, and community contributions to overall district TB notifications rose from 5% to 30%. Despite these successes, logistical constraints in remote areas and occasional community reluctance posed challenges, emphasizing the need for stronger supply chain mechanisms and ongoing education efforts.
Conclusions: The RBACFM model has proven effective in improving TB case detection and treatment initiation, offering a scalable approach for high-burden settings. Key recommendations include expanding the model to additional districts, strengthening community education to address TB-related stigma, enhancing CHW training and incentive structures, and leveraging digital tools for real-time monitoring and resource allocation.

OA29-381-21 Boosting TB prevention: The role of community volunteers in increasing uptake of TB preventive treatment among household contacts in Haryana, India

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Background and challenges to implementation: Tuberculosis Preventive Treatment (TPT) is vital to India's TB elimination strategy, complementing active case finding and infection control. In high-burden settings, prevention is key to reducing transmission. This study explores the impact of engaging Community Volunteers to enhance TPT uptake, adherence and completion among household contacts in Mewat, Haryana—an agriculturally dependent, socio-economically challenged district with limited healthcare access.
Intervention or response: In 2024, the Government of Haryana conducted a prospective comparative study in Mewat district. The study compared TPT uptake, completion, and loss to follow-up (LTFU) rates in HHCs for 2023 and 2024. Data was extracted from Ni-kshay (India's digital TB surveillance portal) and analyzed with SPSS.v.22. Five trained Community Volunteers (one per 0.25 million population) were enrolled to ensure timely initiation, adherence, and completion of TPT, and to update health staff on challenges. As part of the National TB Elimination Program, to recognize the efforts of the community volunteers, an honorarium of $2.90 per HHC was awarded, upon successful treatment completion, depending on regimen and duration.
Results/Impact: In 2024, a total of 4,236 (60%) HHCs out of 7,037 initiated on TPT, compared to 2,061 (34%) out of 6,048 in 2023, as recorded in Ni-kshay. Treatment completion rose significantly from 23% in 2023 to 75% in 2024. Additionally, LTFU was reduced to 5%, highlighting the positive impact of community engagement in improving TPT outcomes.
Conclusions: The intervention clearly demonstrates that engaging trained Community Volunteers significantly improves the uptake, adherence, and completion of TPT among household contacts in high-burden, underserved regions. The remarkable increase in treatment completion from 23% to 75% and the reduction in loss to follow-up to 5% underscore the critical role of community-based support in strengthening TB prevention efforts. This model holds strong potential for replication in other similar high burden resource-limited settings.

OA29-382-21 TB notifications by community-based volunteers in communities serviced by mission health facilities in Zambia: Translating WHO guidance into practice

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Background and challenges to implementation: Zambia, ranked 21st among the 30 high TB burden countries, reported an estimated 307 TB cases per 100,000 population in 2021. To improve TB management, the country has adopted a decentralized approach, leveraging NGOs and CSOs to bridge care gaps. The Churches Health Association of Zambia (CHAZ), an interdenominational umbrella organization for Church Health Institutions (CHIs), supports community TB services through 162 health facilities, serving 5 million people, primarily in hard-to-reach areas. Key community activities include behavior change communication, presumptive TB case identification, sputum sample collection and transport, and directly observed therapy (DOT). Diagnosis and

treatment initiation occur within CHIs, and a core CHAZ indicator, aligned with WHO guidelines, tracks new TB cases diagnosed and notified through community health worker referrals in each facility's catchment area.

Intervention or response: Aligned with WHO guidance and Global Fund insights, CHAZ has enhanced community-level TB control to accelerate case detection. A differentiated active case finding (ACF) approach, combining quarterly ACF campaigns with TB awareness initiatives led by community-based volunteers (CBVs), has significantly increased TB notifications, as outlined below.

Key investments in CBVs include annual MOH-approved training, quarterly onsite mentorship, transport assistance, and essential supplies for sputum sample transport. From 2018 to 2023, CHAZ supported 559 TB-specific CBVs before transitioning in 2023 to 1,200 polyvalent CBVs, integrating TB, HIV, and Malaria services.

Results/Impact: Regular quarterly reviews have been conducted to assess progress. A key indicator measuring CBVs' contributions to TB notifications has produced the following results.

Conclusions: A decentralized, community-based approach led by CBVs is instrumental in improving early TB detection in underserved populations. This strategy has increased TB notifications by 20% in CHAZ-supported CHIs, aligning with WHO guidance.

Well-trained, motivated, and properly equipped CBVs are essential for effectively implementing and expanding community-based TB activities and referrals.

OA29-383-21 Comparative yields of TB preventive therapy from community contact tracing and facility based contact invitation strategies: Implications for programmatic implementation

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Background and challenges to implementation: The World Health Organization recommends screening for household members and close contacts of bacteriologically confirmed pulmonary TB (PTB) to prevent Tuberculosis (TB). Facility and community-based contact tracing are key to finding undiagnosed TB and increasing tuberculosis preventive therapy (TPT) uptake for those without active TB. Since 2018, AMREF Health Africa and Kenya's National TB program have implemented both strategies. TPT initiation among eligible contacts of bacteriologically confirmed PTB still remains sub optimal. This abstract directly compares the effectiveness of these two approaches in improving TPT uptake.

Intervention or response: We conducted a retrospective cross-sectional study using routinely collected data covering the period 2023 to 2024 obtained from the national case-based surveillance system in Kenya. In the community-based approach, community health promoters were sensitized to conduct screening of household contacts and referred the eligible individuals to health facilities for further evaluation and initiation of TPT.

In the facility-based approach, healthcare workers contacted household contacts and invited them to visit the health facility for screening and possible TPT initiation. Data were analyzed using R software.

Results/Impact: During the review period, a total of 98,916 individuals eligible for TPT initiation were reported. Of these, 84,875 (84%) were initiated on TPT. Community contact tracing contributed to 59.0% (50,082) of those initiated on TPT while contact invitation accounted for 41.0% (34,793).

Logistic regression analysis suggested that both approaches to contact investigation, screening outcome and outcome of TB evaluation were significant predictors of TPT initiation (p-value < 0.05).

Eligible clients identified through the contact invitation strategy had a higher odds of initiating TPT compared to those reached through contact strategy (OR = 2.02 (95% CI: 1.94 – 2.10, p < 0.001).

Conclusions: The two contact investigation strategies are complementary and when strengthened, have the potential to significantly enhance the overall coverage of TPT.

OA29-384-21 Targeting the golden years: Finding missing people with TB among the elderly through targeted outreaches in Siaya County, Kenya

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Background and challenges to implementation: Tuberculosis remains a critical health challenge among the elderly population globally. According to the Kenya 2016 Prevalence Survey, TB prevalence was estimated at 426 per 100,000 adult population, doubling the pre-survey estimate of 266 per 100,000, People most affected by TB were of ages ranging from 25-34 years and elderly of 65 years and above. Siaya County is among the ten counties in Kenya with the highest TB burden. While TB diagnosis and treatment are generally accessible, the elderly face specific challenges including delayed TB detection, diagnosis and treatment. Age-related immune decline and high rates of comorbidities increase vulnerability.
Intervention or response: From January to March 2025, Amref in collaboration with IRDO and Siaya County implemented a three-day screening initiative across 3 subcounties with support from Global Fund. The outreach targeted an organized support group for the elderly 60-95 years as 13.2% of people identified with TB were among elderly in 2023. Mobile digital chest X-ray was utilized featuring AI-assisted interpretation and GeneXpert testing. The elderly and their caregivers were mobilized by Adolescent and Young Persons and Community Health Promoters to attend the screening during their routine meetings.
Results/Impact: The outreach targeted 350 elderly individuals, members of an organized group, 270 (77%) were screened, including 111 men and 159 women. Symptomatic screening identified 40(14.8%) people who were presumptive for TB.
Further radiological screening revealed that 23 participants (8.5%) had abnormalities. On testing 13 (4.8%) people were diagnosed with TB, 7 being bacteriologically confirmed through GeneXpert, while 6 cases clinically diagnosed.
Conclusions: This initiative highlights the elderly as a key population for targeted outreach efforts. By combining targeted mobilization, symptomatic and radiological screening and diagnostics, previously undiagnosed TB cases were successfully identified.
These findings emphasize the importance of scaling similar interventions in other regions to enhance early TB detection among the elderly.

OA29-385-21 Enhancement of TB infection prevention through task shifting to community health volunteers (CHVs)

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Background and challenges to implementation: The World Health Organization recommends a minimum of 4.45 healthcare workers per 1,000 people to achieve adequate health coverage. In Nigeria, however, this ratio is alarmingly low at just 0.77 healthcare workers per 1,000 people, significantly below the recommended benchmark. Nigeria lacks sufficient DOT Officers in its facilities to also implement contact investigation (CI), which is pivotal to reducing TB infection.
This intervention is aimed to train Community Health Volunteers (CHVs) to take up the task of CI and relieve pressure on the DOT officers.
Intervention or response: The intervention occurred in Benue State, Nigeria, in three phases. The first phase consisted of rigorous training for 31 CHVs, along with pre- and post-tests to evaluate their knowledge and skills both before and after the training. The second phase involved the CHVS implementing the CI under the supervision of DOT officers, while the third phase assessed the implementation outcomes both before and during the process. Data were analyzed using SPSS version 29 and the Wilcoxon signed-rank test at a significance level of 0.05.
Results/Impact: The CHVs' training revealed pre-test scores ranging from 15-50%, (26 CHVs scored between 0-45% and 5 CHVs scored between 50-65%) while the post-test ranged from 30-95%, (1CHV each scored between 0-45% and 50-65%, 23 scored between 70-85%, and 6 scored between 90-100%).
The CI implementation revealed that 1634 index patients were contact-traced, 9679 eligible contacts were identified, and 1289 started TPT from October 2023 to March 2024, while 2538 contacts were traced, 23,567 eligible contacts were identified, and 7576 started TPT from April to September 2024. Both index patients contact traced ($p=0.035$) and TPT enrolment ($p=0.019$) were statistically significant after the intervention.
Conclusions: This study demonstrated not only the enhanced TB infection prevention through CI but also how CHVs can provide a critical link with the health systems in resource-constrained settings.

OA29-387-21 Community-based tobacco cessation intervention among chronic smokers in urban slums: A public health approach

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Background: Tobacco use remains a major public health concern, especially in urban slums. Previous studies have largely focused on clinical or individual-level interventions, highlighting a significant gap in community-oriented approaches. This study aims to assess the effectiveness of a structured community-based intervention to help chronic smokers residing in urban slums.
Design/Methods: Baseline data were collected through surveys to identify, screen, and enroll tobacco users (n=109) from the community. Demographic details and tobacco use history were collected using a case record form. The intervention included tobacco awareness sessions, behavioral counseling, and Nicotine Replacement Therapy (NRT). A follow-up assessment was conducted after six months through in-person visits and phone calls using a structured survey form. Descriptive and inferential statistics were used to analyze the data.

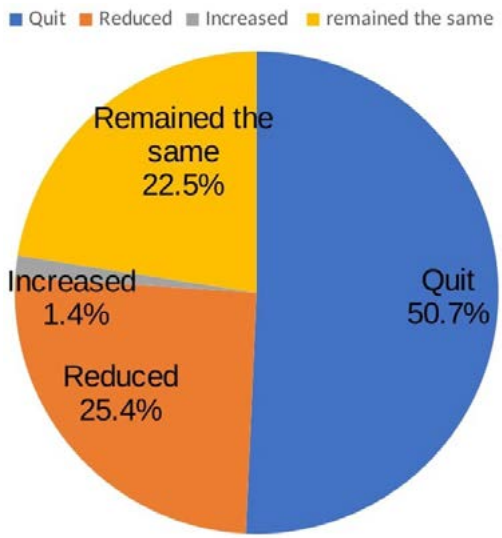

Figure. Current tobacco use after intervention.

Results: Mean age of tobacco users was 53 years, 33.9% completed secondary education, 61.5% were daily-wage workers and 83.5% belonged to low-income group. Majority (88.1%) were smokers, while 11.9% used both forms. Of all, 51.4% initiated tobacco before the age of 18 years and 68.8% were using tobacco for over 30 years. Peer pressure (83.5%) was major reason for initiating tobacco use, and 50.5% continued due to addiction. Of the 71 (65.1%) successfully contacted for post assessment, 15.1% were in precontemplation, 26.8% in contemplation, 7% in preparation, 15.5% in action, and 35.2% were in maintenance stage. Of all, 36 (50.7%) quit and 35 (49.3%) still continue tobacco. Of the current users, 51.4% reported reduced tobacco use and 62.8% attempted to quit tobacco, 77.1% reported motivated to quit following counseling. There is a significant association between reason for initiating and cessation attempts prior intervention.
Conclusions: Behavioral counseling, awareness sessions, and clinical support significantly improved quit and reduction rates among chronic smokers in urban slums. Health concerns and counseling motivated cessation, while addiction remained a key barrier, highlighting the value of community-based interventions.

OA29-388-21 Enhancing TB detection through community-led hybrid contact investigation: A scalable model for hard-to-reach populations

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Background and challenges to implementation: Tuberculosis (TB) contact investigation is crucial in curbing TB transmission, yet traditional methods led by Environmental Health Technicians (EHTs) often missed cases due to accessibility challenges, particularly in remote and hard-to-reach communities. Jointed Hands Welfare Organization (JHWO), under the USAID-funded Kunda Nqob'iTB (KNTB) project, identified key challenges, including low case detection, poor treatment adherence, and high mobility among artisanal and small-scale miners (ASMs), which hindered effective contact tracing.
Intervention or response: To address these barriers, JHWO introduced the TB Hybrid Contact Investigation Model, integrating EHT-led traditional contact tracing with a community-based approach. Community Health Workers (CHWs) were trained in infection prevention, control, and sputum collection, enabling them to support presumptive TB cases at the household level.
The model leveraged digital tools for real-time data collection and strengthened community engagement by involving local leaders and opinion influencers in high-risk populations such as ASMs. These measures facilitated early diagnosis, increased TB Preventive Therapy (TPT) uptake, and reduced stigma associated with seeking healthcare.
Results/Impact: Over a four-and-a-half-year period, the model identified 38,371 contacts, screened 34,537 (90%), and diagnosed 517 (1.5%) TB cases, with 96% initiating treatment. In Mwenezi district, where health facilities are widely dispersed, household-level sputum collection by IPC trained CHW significantly improved case detection. TB notifications from community contributions rose from 5% to 100% at Chingwizi clinic and from 0%

to 43% at Mlelezi clinic. These findings underscore the effectiveness of CHW-led interventions in improving TB case detection and treatment adherence in underserved populations.
Conclusions: The TB Hybrid Contact Investigation Model offers a scalable approach for enhancing TB case detection and treatment adherence, particularly in marginalized communities. Future programs should focus on scaling up CHW training, strengthening community engagement, and integrating digital tools for monitoring and evaluation to optimize TB prevention and control efforts.

OA30 Environmental determinants of lung health: From fossil fuel to filter tips

OA30-389-21 Climate change and TB: An analytical framework

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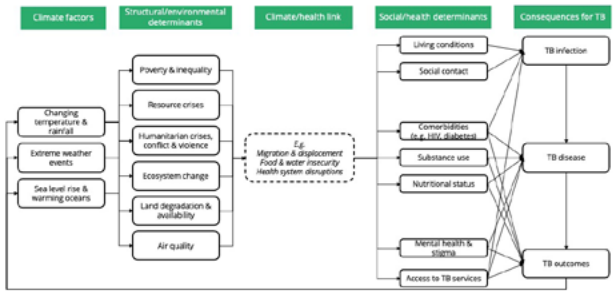
Background: Climate change is likely to exacerbate a range of determinants which drive the global tuberculosis epidemic. However, tuberculosis, the world's leading infectious disease killer, is often neglected in wider climate health discussions.
Design/Methods: Commissioned by the World Health Organization (WHO), we developed an analytical framework outlining potential causal relationships between climate change and tuberculosis. We drew on established knowledge and identified tuberculosis determinants which are likely to be sensitive to the effects of climate change, and conceptualised the mechanistic pathways through which this might occur. We collated evidence for these pathways through literature review and narrative synthesis. The resulting framework was presented at a multi-stakeholder consultation organised by WHO on the impact of climate change on tuberculosis and subsequently updated and refined.
Results: The framework (Figure) first maps how changing climate factors (e.g. changing temperature and rainfall) lead to changes in structural and environmental determinants (e.g. land degradation and availability). These are then linked to health via a series of climate/health links, which complete a direct causal pathway through which changes in structural and environmental determinants

drive changes in exposure to social and health determinants. Lastly, social and health determinants are linked to tuberculosis consequences, where they may affect the likelihood of exposure and susceptibility to tuberculosis infection, the risk of progression to tuberculosis disease, and the extent of vulnerability to tuberculosis outcomes.
Our literature reviews summarised evidence on how three priority climate/health links work across these pathways:
i. migration and displacement;
ii. food and water insecurity, and;
iii. health system disruptions.



Conclusions: The available evidence supports the existence of plausible pathways between climate change and tuberculosis, highlighting the need to include tuberculosis in climate risk adaptation and mitigation programmes, and climate-resilient funding and response mechanisms. Further evidence is urgently needed to quantify the effects of climate change on tuberculosis.

OA30-390-21 Tuberculosis and climate emergency: Community analysis on access to TB services during the floods in 2024 in Porto Alegre, Brazil

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Background and challenges to implementation: Rio Grande do Sul (RS) is the Brazilian state with the highest tuberculosis (TB) epidemic burden. In May 2024, severe flooding struck RS, leading to a health, political, social, and economic crisis that disproportionately affected the most vulnerable populations. To evaluate how this catastrophic event impacted access to TB health services and social policies, the TB social movement conducted a mixed-methods assessment in the metropolitan region of Porto Alegre(RS capital city).
Intervention or response: We carried out a qualitative situational assessment by reviewing government guidelines, conducted in-depth interviews with 09 displaced individuals undergoing treatment for tuberculosis or tuberculosis preventive treatment(TPT), and visited 07 shelters to assess their sanitary conditions and availability of health and social services.
Additionally, a snowball sampling for a quantitative, online, self-administered survey targeting people undergoing treatment for TB or TPT was implemented. The questionnaire included topics on TB prevention, diagnosis, treatment, and access to social policies. Qualitative data were analyzed using content analysis, while descriptive analysis was performed on quantitative data.
Results/Impact: Most of sheltered interviewees (9) reported interruptions in their TB treatment due to lost medications in the floods; feelings of embarrassment and lack of confidential spaces for taking their medication; insufficient information about withdrawal of TB treatment having no documentation or prescription, and experiences of stigma and discrimination.
None of the shelters implemented any TB prevention measures or provided masks. A total of 76 participants completed the survey (51% cis men, 33% cis women, 16% transgender, and 86% PLWHA). Among them, 89% reported treatment interruptions lasting ≥7 days; 97% experienced food insecurity; and 48% described incidents of discrimination.
Conclusions: Strategies deployed by health services to ensure the continuity of treatments were ineffective, highlighting the urgent need for robust, structured contingency plans to mitigate the impacts of climate emergencies on TB and health systems.

OA30-391-21 Asthma and air pollution in Benin: Symptoms' frequency and impact of the harmattan period in adolescents from A4A Project study in Cotonou

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Background: Air pollution influences gene expression, increasing susceptibility to respiratory diseases such as asthma, and increases also frequency and severity of asthma symptoms. We present here the results from follow-up of asthmatic adolescents icohort study in cotonou. The

main objective was to study the occurrence of respiratory events (acute symptoms or 'attacks'/exacerbations) and to assess the link with exposure to particulate matter (PM), whether collective or personal.
Design/Methods: Among 4,500 adolescents from 6th and 5thclassroom in 25 secondary schools in Cotonou ; we set up a cohort of 730 asthmatic adolesecents. Exposure to PM was measured using of Qameleo® sensors installed in the schools and in adolescent's homes. Levels of gaseous pollutants (NO2, CO, O3, VOCs) were measured by 10 fixed COTON® sensors. Individual exposure was monitored by portable MQair sensors, carried in backpacks.
Results: 604 (84%) asthmatics were regularly followed up over 36 months. During this period, 222 (37%) adolescents reported the occurrence of at least one respiratory event. From 2947 monthly visits, exacerbations occurred in 9.3% of person-months. Adolescents with frequent respiratory events had higher levels of personal exposure to several pollutants. Their mean levels of NO2; PM1; PM2.5; and PM10 was respectively : 11.05(±5.23) µg/m3; 18.85(±11.05) µg/m3; 29.05 (±18.8) µg/m3 and 41.96(±29.24) µg/m3. PM2.5 pollution during the harmattan season is inequaly distributed(Figure 1), and also asthma symptoms occur 2.5 times more during harmattan than outside this period. The triggers were: house dust: 57%; outdoor pollution: 26%; temperature change: 21%; and food allergens: 12%.
Conclusions: In Cotonou, air pollution systematically exceeds WHO thresholds for all pollutants. More than 1/3 of asthmatic adolescents had respiratory events, and the harmattan period contributed 2.5 times to the exacerbations's occurrence. Taking into account information on pollution would help to optimise and personalize asthmatic management in this context.

OA30-392-21 Impact of ambient particulate air pollution on intelligence quotient in 6-8 years children in Odisha, India

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Background: Ambient air pollution due to particulate matter (particularly PM2.5 and PM10), is a growing public health concern with documented effects on lung and cardiovascular health. Recent evidence suggests particulate matter may also disrupt early cognitive development. In India pollution levels frequently surpass permissible thresholds, but risk remains underexplored. This study examines the association between particulate air pollution and cognitive function in children aged 6 to 8 years in Odisha.
Design/Methods: A comparative analytical study was conducted at two sites, one with high pollution (PM10>60 µg/m³ & PM2.5>40 µg/m³, n=210) and another with low pollution (n=186), from July to December 2022. Children residing for six years within a 1.5 km radius from air quality monitoring stations were assessed using Malin's Intelligence Scale for Indian Children (MISIC). Full-scale intelligence quotient (IQ), including verbal and performance IQ was assessed. Sociodemographic and environmental variables were included in regression model.
Results: Mean full-scale IQ in high-pollution areas was 80.33 ± 6.11 compared to 98.12 ± 6.33 in low-pollution areas ($p < 0.001$). Children from high pollution areas had a verbal IQ of 81.60 ± 5.57, lower than the 99.68 ± 6.60 observed in low pollution areas ($p < 0.001$). Children had a performance IQ of 79.03 ± 8.33 in high-pollution areas, compared to 96.55 ± 8.46 in low-pollution areas ($p < 0.001$). The regression model suggested that full-scale IQ was significantly associated with air pollution exposure, child's age, poor kitchen ventilation, maternal education, child's weight, and family income.
Conclusions: Long-term exposure to air pollution is closely linked to poorer cognitive development in children. This study highlight the importance of considering brain health in lung health strategies and call for immediate efforts to protect young children from ambient air pollution.

OA30-393-21 Effect of food insecurity on TB incidence in climate sensitive Karamoja region of Uganda

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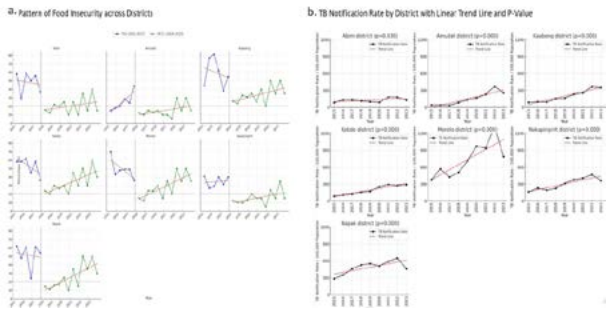
Background: Key risk factors for tuberculosis include food insecurity/undernutrition, both of which may be worsened by the effects of climate change (CC). We conducted an ecological study to investigate the relationship between food insecurity (FI) and TB case notification at population level in Karamoja region (Uganda), that has persistent high levels of FI and tuberculosis incidence, and is highly vulnerable to CC.
Design/Methods: We aggregated secondary biannual data on FI, i.e. the Food Consumption Score (FCS) (from Food Security and Nutrition Assessment Survey (2015-2017) and Integrated Food Security Phase Classification [IPC]) (2018-2023) and on TB notification (from pro-

grammatic records) at district level between 2015-2023. We performed time series analysis using Augmented Dickey-Fuller test, linear regression, and Mann-Kendall tests to assess trends, seasonality and patterns of FI and TB notification. Temporal relationships between FI and TB cases were assessed using Vector Autoregressive (VAR) models and Granger causality test.

Results: We confirmed the chronic burden of FI and TB in Karamoja with high seasonality in FI, identifying Kaabong, Kotido and Moroto as hotspot districts where more than 25% of households experienced FI. In pre-2018 analysis based on FCS (Figure), districts showed stationarity trends of FI except in Amudat and Kotido, indicating relatively stable pattern ($p<0.05$), whereas increase in trends ($p<0.05$) was observed in the majority of districts post-2018.

Overall, TB notification rates increased by 37% annually (*p<0.01*), with the highest increase observed in Moroto district (89% annual increase, *p<0.01*).

Figure: Pattern of Food Insecurity and TB notification in Karamoja Region, Uganda, 2015-23



The VAR model suggested that FI temporally impacted TB case notification, with a lag of 2 years (*p=0.03*). No reciprocal effect of TB notification on FI was found (*p=0.51*).

Conclusions: Our preliminary analysis underscores the seasonal patterns of FI and increasing trend of FI and TB notification rates over time, but potential confounding factors, including programmatic interventions, might have contributed for increase in TB notification rates.

OA30-394-21 Factors contributing to delayed TB diagnosis in Somalia: Survey data identifies poverty, malnutrition, displacement, and low awareness as key factors delaying TB diagnosis in Somalia

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Background: Delayed tuberculosis (TB) diagnosis is a major barrier to TB control, especially in Somalia. This is as a result of the fragility context of the country which leads to weak health systems, presents a critical case to understand how structural vulnerabilities—poverty, malnutrition, and displacement—contribute to diagnostic delays.

Design/Methods: A nationally representative, cross-sectional TB patient cost survey was conducted in 2024 across 36 TB treatment facilities in Somalia. Of the 1,005 DS-TB patients interviewed, 961 were included in the analysis. Structured questionnaires were used to collect data on care-seeking behavior, socioeconomic status, and awareness of TB services. Data were entered using CSPro and analyzed using STATA version 17. Diagnostic delays were defined as >14 days from symptom onset to treatment initiation and summarized using medians and interquartile ranges.

Results: Among 961 patients, 736 (77%) experienced diagnostic delays >14 days. The median delay was 37 days—30 days patient delay and 7 days system delay. Results indicate that the below factors contributed to delay in diagnosis

- 614 (64%) lived below the international poverty line ($1.90/day).
- 510 (53%) were undernourished.
- 384 (40%) reported moderate to severe food insecurity.
- 213 (22%) were internally displaced (median delay: 45 days vs. 32 days for non-displaced).
- 374 (39%) were aware that TB treatment is free. (services, 2024)

Conclusions: Three-quarters of DS-TB patients (736 of 961) experienced significant diagnostic delays. These delays were driven by poverty, undernutrition, displacement, low awareness of free TB services, and reliance on informal providers. The National TB program together with its stakeholders have begun mitigation measures by developing policy documents e.g. MAF and PPM policy to better guide TB control activities and improve health literacy in the country. These actions are essential to reduce delays and achieve equitable, timely TB care in fragile settings like Somalia

OA30-395-21 Ten-year trends in second hand smoking (SHS) in Europe 2012-2023: A snapshot review

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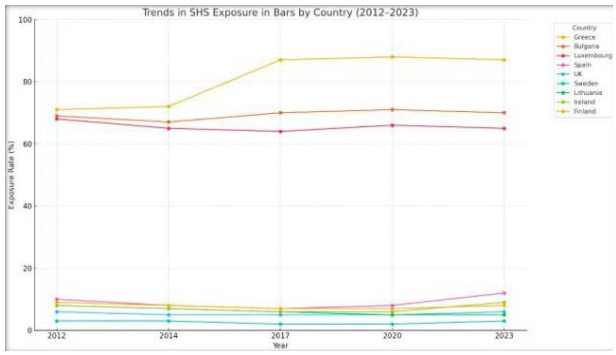
Background: Nearly one-third of cancers are linked to tobacco, including second-hand smoke (SHS), which raises cancer risk by up to 16% in non-smokers. In December 2024, the EU recommended reducing SHS exposure outdoors. SHS exposure affects 31% of Europeans, varying by country and policy enforcement.We examined trends from 2012 to 2023

Design/Methods: We reviewed various tobacco surveys and collated them mainly from the Eurobarometer surveys done in 2012, 2014, 2017, 2020, and 2023. The data was scrutinised to ascertain the trends of passive smoking with individual country data in Europe.

Results: There is variability in secondhand smoke (SHS) exposure rates among European countries. Greece has consistently high levels of SHS exposure, despite existing regulations. In contrast, Spain, the UK, Sweden, Finland, and Ireland demonstrate low and stable SHS levels, which suggests effective law enforcement and a good public understanding of the risks involved.

Bulgaria and Luxembourg show moderately declining trends in SHS exposure, while Lithuania has experienced a significant reduction since 2012. However, in 2023, some countries like Spain and Ireland are seeing an upward trend in SHS exposure, which may be linked to enforcement fatigue or an increase in social activity.



Conclusions: Second-hand smoke remains a significant public health threat in Europe. Despite some progress, exposure is still growing in some countries, especially in countries with less robust tobacco control policies. Continued legislative action and public support are key to reducing SHS exposure and achieving the EU's 2040 smoke-free goal.

OA30-396-21 A comprehensive bibliometric exploration on the health impact of e-cigarettes

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Background: E-cigarettes, or vapes, are battery-powered devices that heat a liquid—typically containing nicotine and other chemicals—to produce an aerosol inhaled by the user. Often mistaken for harmless vapor, this aerosol contains fine particles and harmful substances. Their popularity, especially among youth, stems from perceived reduced harm compared to traditional tobacco. In 2021, an estimated 82 million people globally used e-cigarettes. However, growing evidence links their use to respiratory, cardiovascular, neurological, and metabolic comorbidities. This study examines global research trends on the health effects of e-cigarettes.

Design/Methods: A bibliometric analysis was conducted using the Scopus database, applying the Population–Exposure–Outcome Framework to examine global research on e-cigarette-related health effects. Keywords related to e-cigarettes ("electronic cigarette" OR "e-cigarette" OR "vaping") and health outcomes ("disease" OR "health effect" OR "morbidity") were combined using Boolean operators. The search was restricted to English-language publications from 1974 to 2024. Out of 26,018 retrieved documents, 18,038 research articles met the inclusion criteria and were included in the final analysis.

Results: A comprehensive bibliometric analysis of 18,038 articles revealed a 400% rise in annual publications on e-cigarettes between 2015 and 2023, with 65.4% published after 2018. The United States led in output, followed by the UK, China, Germany, Italy, and Canada.

Co-occurrence network analysis highlighted dominant themes such as human demographics, smoking cessation, and electronic nicotine delivery systems. Temporal trends showed a shift from health systems research to behavioral and regulatory themes post-2016.

Word cloud visualization reinforced the prevalence of terms like smoking, vaping, nicotine, and adolescents, indicating growing scholarly focus on health risks and emerging tobacco products.

Conclusions: The growing body of research underscores the association between e-cigarette use and major health risks, particularly respiratory and cardiovascular. Despite increasing output, gaps remain in long-term and policy-oriented studies. Collaborative and longitudinal research is essential to inform evidence-based regulations.

OA30-397-21 Global trends and industry influence in tobacco harm reduction research: A bibliometric analysis (2014–2024)

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Background: Tobacco harm reduction (THR) is increasingly promoted as a public health strategy due to the proliferation of electronic nicotine delivery systems (ENDS), heated tobacco products (HTPs), and nicotine pouches. However, concerns persist that the tobacco industry's involvement in THR research may influence the evidence base and shape global policy discussions.
This study aimed to assess global research trends, identify dominant actors and themes, and examine the extent of tobacco industry affiliation in THR literature.
Design/Methods: A bibliometric analysis was conducted on 354 peer-reviewed THR-related publications indexed in Scopus between 2014 and 2024. VOSviewer software was used to perform co-citation analysis, bibliographic coupling, and keyword co-occurrence mapping. Author affiliations were manually screened using institutional data and conflict-of-interest statements to classify studies as tobacco industry-affiliated, tobacco control/public health-affiliated, or unclassified. Descriptive statistics were used to quantify research output, citation trends, and affiliation types.

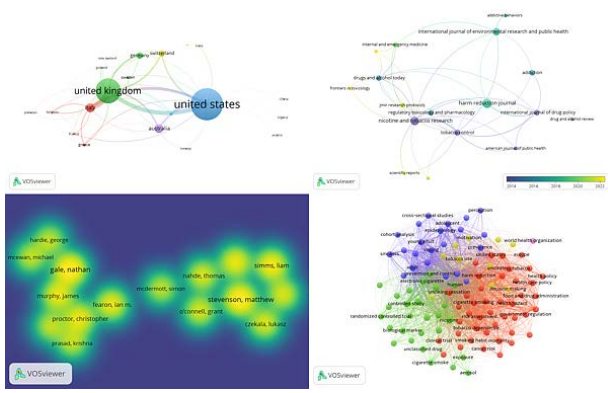

Figure: Visual Mapping of Global THR Research Themes and Networks (2014–2024).

Results: THR publications increased significantly after 2019. The United States and the United Kingdom contributed the most to publication and citation volume. Three core thematic clusters were identified: toxicological research, policy and regulation, and behavioral studies.
Bibliographic coupling revealed two dominant author networks, both linked to transnational tobacco companies such as British American Tobacco and Philip Morris International. Of the 354 studies, 79 were industry-affiliated, 24 were tobacco control-affiliated, and the remainder were initially unclassified. Deeper analysis revealed that many unclassified studies involved authors with undisclosed or indirect industry ties.
Conclusions: The THR research landscape is shaped by a small number of highly networked, industry-linked authors and institutions. This concentration risks distorting the scientific narrative favoring product-based harm reduction strategies. Strengthening independent, public health–driven research and increasing transparency in author disclosures are essential to ensure balanced evidence for global tobacco control policymaking.

OA30-398-21 Heated tobacco product use and tobacco abstinence: A prospective cohort study

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Background: Heated tobacco products (HTPs) have gained popularity in recent years, particularly among individuals seeking to quit smoking conventional cigarettes. Despite their growing use, the effectiveness of HTPs in supporting smoking cessation and achieving tobacco abstinence remains unclear.
This study aimed to examine whether HTP use was associated with abstinence from cigarettes and from all tobacco products in a large, population-based cohort in Japan.
Design/Methods: We conducted a sequential follow-up analysis of a prospective cohort using data from a nationwide, internet-based, self-reported survey conducted annually between 2019 and 2023. The study included 7,501 Japanese adults (aged ≥20 years) who were current cigarette smokers at baseline.
Participants were classified as exclusive cigarette users (n = 4,989) or dual users of cigarettes and HTPs (n = 2,512). Primary outcomes were 1-year abstinence from cigarette use and total tobacco abstinence.
Rate ratios (RRs) and 95% confidence intervals (CIs) were calculated using inverse probability-weighted Poisson generalized estimating equation models, adjusting for sociodemographic variables, use of evidence-based cessation support, smoking dependence, and survey year.
Results: After one year, 19.5% of exclusive cigarette users and 18.2% of dual users reported abstinence from cigarette use (RR, 0.93; 95% CI, 0.83–1.04).
Total tobacco abstinence was achieved by 17.3% of exclusive cigarette users and 8.2% of dual users (RR, 0.49; 95% CI, 0.42–0.58).
Conclusions: Dual users were significantly less likely than exclusive cigarette users to quit all tobacco products. These findings suggest that HTP use, particularly in combination with cigarette use, may not facilitate successful tobacco cessation.

OA31 Informing evidence-based TB policies

OA31-399-21 Power, players and politics: Who are the power brokers of TB control in Pakistan - International donors or national leadership?

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Background: Pakistan is the fifth highest TB burden country, yet only 5.5% of TB financing is domestically resourced (Global-TB report 2024) with heavy reliance on the Global Fund for AIDS, Tuberculosis and Malaria (GFATM). An in-depth strategic review was commissioned by Ministry of National Health Services, Regulation and Coordination, Pakistan, to assess how GFATM's long-term financial assistance has strengthened the TB programme, including an in-depth stakeholder analysis cutting across themes of governance, service delivery and financial sustainability.
Design/Methods: Stakeholder analysis followed a mixed-methods approach embedded within the broader strategic review of GFATM. Stakeholder mapping was informed by a desk-review. In-depth interviews were conducted with a total of 232 key informants from federal and provincial governments, implementing partners, donors, and civil society. Data were analyzed using NVivo. Stakeholder analysis included roles, interest, level of influence, decision-making processes.
Results: Analysis identified concentration of influence among limited key actors. Geneva-based GFATM secretariat remains the key decision-maker and agenda-setter in the country. Country Coordinating Mechanism (CCM), comprising federal and provincial government representatives, has been rendered powerless by the imposition of Additional Safeguard Policy (ASP), allowing GFATM to directly make decisions regarding the primary implementers of TB programme. Mercy Corps, primary recipient for TB in private sector directly reports to GFATM, bypassing the national TB programme. Local Fund Agent (LFA) acts as GFATM's in-country monitor. NTP maintains little oversight function especially across private sector. Provincial TB Control Programs have limited voice in strategic decision-making forums, despite being central to service delivery. Co-ordination among principal recipients, sub-recipients and provinces remains fragmented, and community and civil society participation remains minimal (Figure-1).

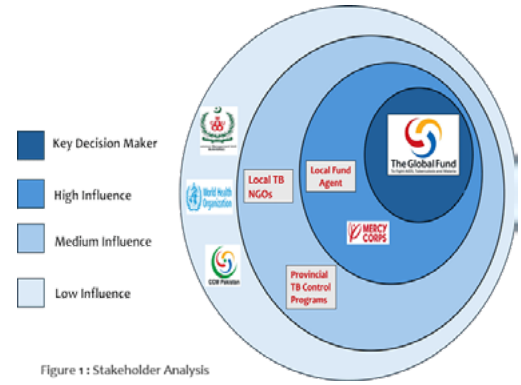

Figure 1: Stakeholder Analysis

Conclusions: TB landscape in Pakistan is dominated by donors for leading strategic decision-making and financing, undermining the national leadership. As the world grapples with abrupt donor freezes and shifting geopolitical priorities, Pakistan must transition to domestic leadership and financing.

OA31-400-21 Comparing the relative epidemiological impact, costs and cost-effectiveness of TB interventions across three countries

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Background: While a range of interventions exists for TB - spanning prevention, screening, diagnosis, and treatment - their potential impact and cost-effectiveness are seldom compared across domains and settings with different background TB epidemiology and structural drivers.
Design/Methods: We calibrated a deterministic TB model, including transmission, non-infectious and asymptomatic disease and key structural drivers, to TB epidemiological indicators in South Africa (HIV), Brazil (incarceration) and India (undernutrition).
We implemented a standard set of seven interventions focussing on prevention, diagnosis and treatment of TB (Figure) as well as nutritional supplementation in India and TB screening in prisons in Brazil. To enable comparison between interventions, we standardised scale-up (2025-2030), target coverage (80% of relevant population), and strength of evidence for epidemiological impact (availability of published efficacy data).
We estimated epidemiological impact by 2050 (reduction in prevalence, incidence and deaths) and costs per disability-adjusted life year (DALY).

Results: We found that only three interventions prevented >10% of incident TB episodes by 2050: vaccination (15-28% across countries), community screening (32-38%) and screening in prisons (23%) (*Figure*).
Impact of other interventions was more limited, between 0% (shortened drug-susceptible treatment) to 5% (nutritional intervention). Cost-effectiveness ratios ranged from cost-saving (e.g. shorter drug resistant therapy in Brazil and South Africa) to over 10,000 USD/DALY averted (high-cost community screening in Brazil).
In Brazil and South Africa, all interventions except shortened drug-susceptible treatment and, in Brazil only, high-cost community screening, appear to be cost-effective, while no intervention was below the cost effectiveness threshold in India.

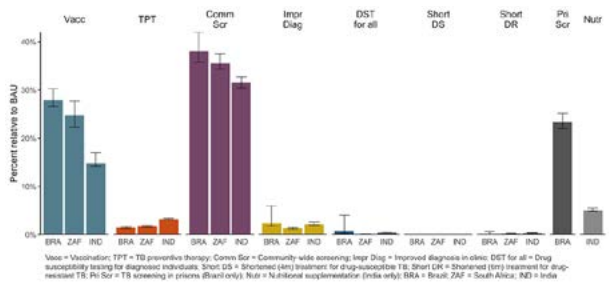

Figure. Incident TB episodes averted grouped by intervention (2025-2050).

Conclusions: By comparing impact and costs across intervention domains and settings with modern evidence, we highlight strong differences between interventions in terms of potential epidemiological impact and their costs-benefit, informing crucial discussions around prioritisation for funding, policy and product development.

OA31-401-21 New drugs, diagnostics and vaccines in India: Their potential impact on TB burden, and priorities for their development

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Background: Emerging tools, such as new drugs, diagnostics and vaccines, raise key questions for strategic planning in the TB response: what is their potential impact in high-burden settings? Across this range of potential new tools, what are the highest-priority needs, to maximise reductions in TB incidence and mortality?
We aimed to address these questions using mathematical modelling with a focus on India, the country with the world's largest TB burden.

Design/Methods: We developed a novel model of TB transmission dynamics in India, incorporating data on the diagnostic pathway, and from India's recent national prevalence survey. We performed the following analyses: (i) 'Intervention projections': we simulated the potential impact of hypothetical new, more-effective regimens; improved diagnostics in routine TB care; population screening for TB; and a prevention-of-disease vaccine. (ii) 'Strategic priorities': Shifting focus to the TB cascade, rather than specific interventions, we analysed which existing gaps would – if addressed – yield the largest reductions in TB burden in India.
Results: Figure 1 (left panel) shows projected incidence reductions from new tools, acting in successive combination. For example, screening 15% of the population per year with chest X-ray followed by NAAT confirmation would reduce incidence rates in 2040 by an incremental 24% (95% uncertainty intervals 17 – 33%), relative to no intervention. Analysis of strategic priorities (right panel) highlights that in future, the greatest reductions in TB disease burden would result from interventions that can target the pre-careseeking delay, and the risk of developing TB following infection.

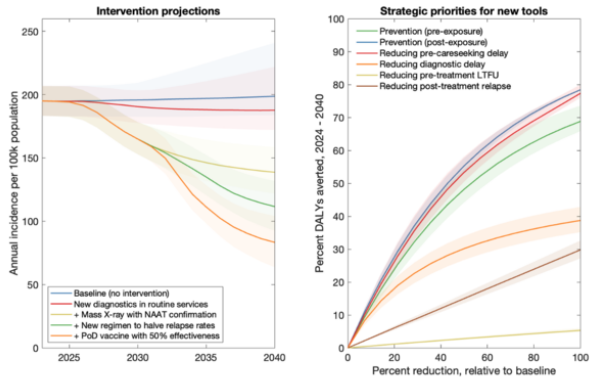

Figure: The potential impact of new tools on TB burden in India. *Left-hand panel*: Projected incidence under different interventions acting in successive combination, with the following assumptions: new diagnostics would facilitate increased microbiological testing for TB at the primary care level. Ultraportable X-ray machines, coupled with high-throughput NAAT, would allow screening of 15% of the population per year (prioritised as needed, amongst high-prevalence groups). From 2030 onwards, a new regimen would be sufficiently shortened and simplified, to promote treatment completion and cut post-treatment relapse by half. Also from 2030, a new vaccine would have 50% effectiveness in reducing the risk of progression to TB, amongst people with infection. *Right-hand panel:* Shifting focus from specific interventions to TB cascade, the potential impact of addressing different gaps in the TB cascade. On the x-axis, the value 0% represents no intervention, while 100% represents a hypothetical scenario where respective gaps are fully closed.

Conclusions: The combined use of new drugs, diagnostics and vaccines could achieve substantial reductions in TB burden. Nonetheless, these findings highlight the critical role of new tools that can facilitate accelerated case-finding (e.g. highly portable X-rays with AI reads) and post-exposure prevention of TB (e.g. a prevention-of-disease vaccine, or nutritional support).

OA31-402-21 Combination strategies to control the TB epidemic in the Karamoja subregion of Uganda: A modelling analysis

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Background: The Karamoja subregion in north-eastern Uganda is disproportionately affected by TB, with an estimated prevalence more than three times the national average. Although current health systems strengthening interventions have achieved substantial increases in the number of people treated for TB, their impact on TB incidence and mortality is less clear.
We aimed to assess the impact of current and additional interventions, tailored to the context of the TB epidemic in Karamoja, to achieve further reductions in TB incidence and mortality.

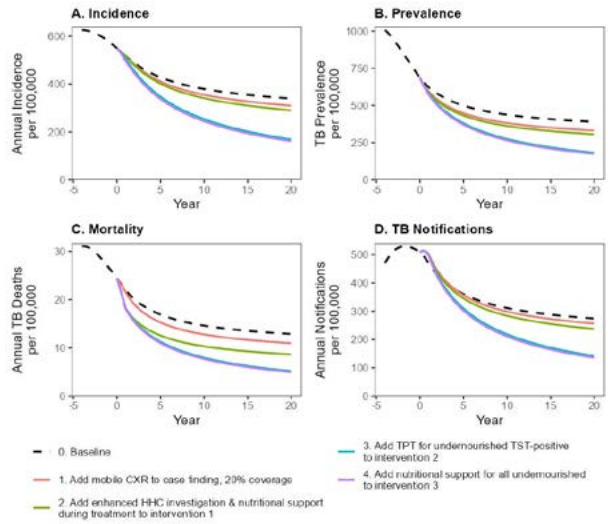

Figure: Projected declines in annual TB incidence (A), prevalence (B), mortality (C) and notifications (D) per 100,000 population following the layered implementation of various interventions. Black dashed lines: current health systems strengthening interventions continued over 20 years. (1) Red lines: Bi-annual community-based active TB case-finding using CXR to screen for TB achieving 20% population coverage. (2) Green lines: Adding to intervention 1 enhanced contact investigation and nutritional support for the undernourished during TB treatment (3) Blue: Adding to intervention 2 provision of TPT to all undernourished TST positive persons found during community based active TB case-finding. (4) Purple: Adding to intervention 3 provision of nutritional support to all undernourished patients found during community-based active TB case finding.

Design/Methods: We developed a dynamic compartmental model calibrated to TB epidemiology in Karamoja (population 1.4 million, 50% children <15 years, 34% undernourished, TB incidence: 670/100,000 and TB prevalence 853/100,000).
In addition to current health systems strengthening interventions, we modelled four layered interventions: community-based active TB case-finding using chest X-ray with computer aided detection covering 20% of the population; increased home-based contact investigation plus nutritional support for undernourished persons with TB disease; community-wide testing and treatment of TB infection; and nutritional support to undernourished persons with TB infection. We estimated the number of tuberculosis disease episodes and deaths that could be averted over 20 years.
Results: Over 20 years, continued implementation of current health systems strengthening interventions would decrease TB incidence by 2.4% per year to 339/100,000 and TB mortality by 3.2% per year to 13/100,000. The implementation of four additional interventions would accelerate declines in TB incidence and mortality bringing TB incidence to 161/100,000 and TB mortality to 5/100,000 at 20 years. This would result in 47,500 (95% CI 18,000-76,600) TB cases and 2,400 (95% CI 1,000-4000) TB deaths averted compared to current interventions.
Conclusions: Combination interventions to reduce undernutrition and find people with TB disease and infection can have substantial epidemiological impact in the Karamoja subregion of Uganda.

OA31-403-21 What will it take to achieve the End TB targets in South Africa?

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Background: The WHO End TB strategy targets an 80% reduction in TB incidence between 2015 and 2030. Recent cuts in donor funding for TB and HIV programmes have prompted renewed focus on the most critical drivers of TB incidence in sub-Saharan Africa. We aimed to assess which factors are likely to be most critical in South Africa, a country with one of the highest TB incidence rates globally.
Design/Methods: We adapted an existing mathematical model of TB and HIV in South Africa (Thembisa). Prior distributions were specified to represent uncertainty ranges for 30 model parameters that were considered to be highly uncertain and potentially important in driving future TB incidence. Latin Hypercube Sampling was used to draw a sample of 1000 parameter combinations from these distributions, and the model was projected to 2040 for each parameter combination. Partial rank correlation coefficients (PRCCs) were calculated between each parameter and the average adult TB incidence rate over the 2025-2040 period.
Results: The adult TB incidence rate in South Africa is projected to decline by 34% by 2030, relative to 2015 levels (95% CI: -13% to 63%). The parameters most strongly associated with future TB incidence are the probability of

microbiological testing when seeking treatment for TB symptoms (PRCC=-0.97), the future diabetes prevalence (PRCC=0.79), the reduction in social contacts post-COVID (PRCC=-0.74), future smoking rates (PRCC=0.58), the efficacy of 3HP in curing TB infection (PRCC=-0.52) and the prevalence of binge drinking (PRCC=0.40; see Figure).

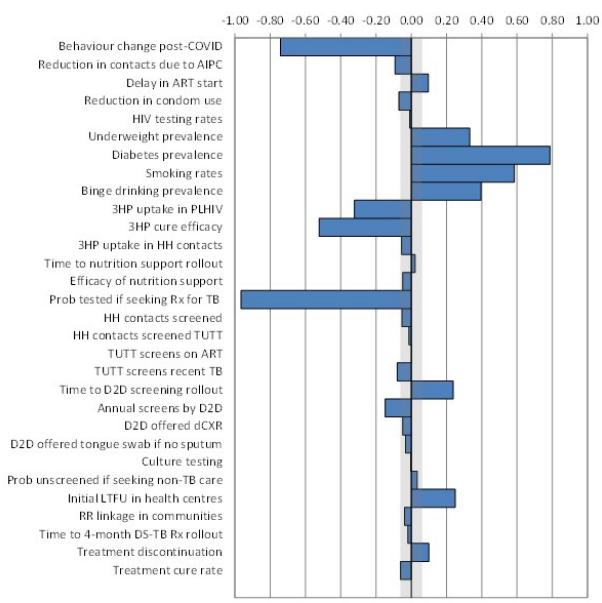

Figure: Partial rank correlation coefficients between 30 parameters and average TB incidence rates in South Africa over 2025-2040
Shaded grey area represents correlation coefficients that are not significantly different from zero. 3HP = 3 months of isoniazid and rifapentine (TB prevention), AIPC = airborne infection prevention and control, ART = antiretroviral treatment, D2D = door-to-door (community-based testing), dCXR = digital chest X-ray, DS-TB Rx = drug-sensitive TB treatment, HH = household, LTFU = loss to follow-up, RR = relative rate, TUTT = targeted universal TB testing.

Conclusions: It is unlikely that the End TB targets will be met in South Africa, given currently available interventions. However, it is possible to achieve substantial reductions in TB incidence with increased microbiological testing in symptomatic individuals and renewed focus on risk factors such as diabetes and smoking. Further analysis is needed to assess which interventions will be most cost-effective.

OA31-404-21 TBMod: A flexible, open-source framework for modelling TB

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Background: TBMod is a versatile modelling framework to simulate the transmission and progression of tuberculosis (TB), and allows us to project the health and economic impact of interventions. The model has undergone major development during 2024-25, with the latest features highlighted below.
Design/Methods: TBMod is a deterministic model implemented in R that simulates TB transmission using ordinary differential equations. The framework allows users to specify model structure in an XML file, without changing the source code. Users specify 'dimensions' (e.g. TB natural history, age, HIV) and how many strata exist within each dimension (e.g. susceptible, infected). Users can also make parameters defined for one dimension dependent on states in another dimension, e.g. TB progression may depend on HIV status. Previously six dimensions were routinely specified - TB, age, HIV, socioeconomic status, risk and vaccination status. Transmission is determined by the transmission probability per contact and number of contacts per day between age groups specified by contact matrices. The R package deSolve solves the differential equations.
Results: New features:
Expanded Dimensions: Five additional dimensions are included for modelling TB drug resistance, diverse intervention strategies (e.g., treatment, vaccine combinations), and risk factors (e.g., smoking, incarceration, and undernutrition).
Trigger-by-Transition: Changes in one dimension (e.g., ending TB treatment) now prompt adjustments in multiple related dimensions, such as TB state and drug resistance levels.
Diagnostic-Based Treatment: Treatment protocols can be tailored based on a combination of diagnostic test results.
Assortative Mixing in Model States: Particularly in environments like prisons, population mixing is modelled based on incarceration status, with restricted interactions between incarcerated and non-incarcerated groups.
Conclusions: TBMod is a flexible framework with increasing utility from new features. These allow us to better estimate the impact, effectiveness and cost of interventions to identify and counter TB. In turn, we can select an optimal mix of interventions for a given budget.

OA31-405-21 Large notification impact of a multi-component active case finding and person-centered care intervention in urban Viet Nam: The Erase TB case study

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Background and challenges to implementation: To end TB, it is necessary to reach all persons with TB, whether asymptomatic, underdiagnosed or under-reported. Further, services have to be patient-centered to increase treatment linkage and retention. To achieve these ambitions, all three pillars of health systems, public, private and community, need to be engaged.
Leveraging those pillars, the Erase TB project employed a tri-factor active case finding (ACF) approach combined with social support to close the treatment coverage gap all along the TB care cascade.
Intervention or response: The 3-year project was implemented jointly with the National TB Program (NTP) from Q2/2020-Q1/2023 in 10 districts of Ha Noi and Ho Chi Minh City, Vietnam, and compared to eight control districts. The project leveraged primary care officers for community engagement and contact investigation, pop-up health screening campaigns for hotspot mass screening and public-private mix (PPM) for facility-based case finding and private treatment notification. The project provided Xpert as a first-line diagnostic test for everyone with TB-abnormalities on chest X-ray (CXR) irrespective of symptoms. Monetary and non-financial social support was provided to enhance treatment linkage and adherence. The notification impact was analyzed based on control-adjusted, pre-/post-intervention trends.
Results/Impact: In total, the project screened 305,412 individuals by CXR, tested 29,647 on Xpert and detected 11,575 persons with all forms of TB. Of these, 96.8% (11,199/11,575) were linked to care, including 75.5% (8,735/11,199) treated in the private sector. About 56.3% (6,303/11,199) of these treatment notifications were additional based on the trend analysis.
Despite the impact of COVID-19 lockdowns, the NTP's average quarterly notification rate in the intervention area increased by 42.5% from 1,232 to 1,756, which was sustained throughout the project.

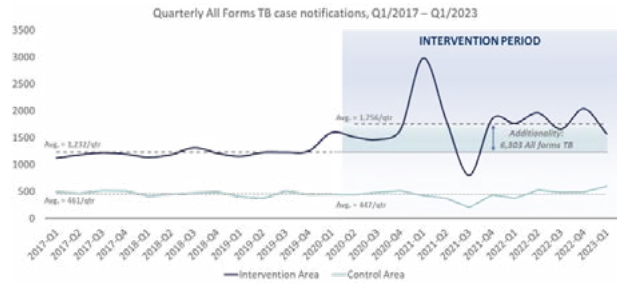

Figure. Quarterly all forms TB case notifications, Q1/2007 - Q1/2023.

Conclusions: A sustained, comprehensive package of ACF interventions complemented by social support can substantially narrow treatment coverage gaps and should be considered for scale-up in order to achieve end TB ambitions.

OA31-406-21 Potential impact, costs, and benefits of population-wide screening interventions for TB in Viet Nam

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Background: Population-wide screening may accelerate the decline in tuberculosis incidence, but optimal screening algorithms and durations must balance resource considerations.

Design/Methods: We calibrated a deterministic TB transmission model, including non-infectious and asymptomatic disease, to TB epidemiology in Viet Nam. We designed three population-wide screening algorithms from 2025: using sputum nucleic acid amplification test (NAAT, Xpert MTB/RIF Ultra) only; chest radiography (CXR) followed by NAAT; and CXR only (i.e., without microbiological confirmation).

We determined the number of annual screening rounds required to reduce pulmonary TB prevalence below 50 per 100,000 people. Cost-effectiveness was assessed using incremental cost-effectiveness ratios (ICERs), representing the additional costs (in US$) per disability-adjusted life year (DALY) averted compared to business-as-usual by 2050.

We considered the total number treated and the budgetary impact. Additionally, we assessed the impact of reducing the NAAT unit price from US$8 to US$1.

Screening algorithm	BAU	NAAT		CXR+NAAT		CXR
Rounds required to reach the threshold	Not reached	6 annual rounds		8 annual rounds		3 annual rounds
Cumulative TB incidence	2.25m (95%UI: 1.57-3.04)	0.95m (95%UI: 0.63-1.31)		0.93m (95%UI: 0.63-1.29)		0.51m (95%UI: 0.36-0.71)
Cumulative DALYs	8.12m (95%UI: 5.85-10.83)	3.74m (95%UI: 2.64-4.99)		3.85m (95%UI: 2.75-5.13)		2.21m (95%UI: 1.59-3.01)
Unit price of NAAT	N/A	US$8	US$1	US$8	US$1	N/A
Cost of diagnosis and screening	363m (95%UI: 222-578)	2,428m (95%UI: 1,675-3,465)	991m (95%UI: 693-1,360)	1,211m (95%UI: 845-1,719)	962m (95%UI: 679-1,335)	350m (95%UI: 251-474)
Cost of treatment	138m (95%UI: 86-209)	336m (95%UI: 220-511)		253m (95%UI: 152-393)		2,609m (95%UI: 1,552-3,941)
Annual cost of front-loading	N/A	427m (95%UI: 299-599)	190m (95%UI: 138-258)	161m (95%UI: 111-224)	129m (95%UI: 92-174)	949m (95%UI: 606-1,415)
Annual cost savings	N/A	12.3m (95%UI: 6.5-21.4)		12.7m (95%UI: 6.7-21.4)		15.6m (95%UI: 9.2-24.7)
ICER compared with BAU	N/A	516 (95%UI: 233-1,073)	189 (95%UI: 71-426)	225 (95%UI: 85-520)	167 (95%UI: 57-380)	410 (95%UI: 178-929)

Results: NAAT-based algorithms required at least six rounds to reach the prevalence threshold, while CXR-only required three. The NAAT-only algorithm achieved a prevalence reduction consistent with the ACT3 trial after three rounds.

The CXR+NAAT algorithm averted 3.85m DALYs (95%UI:2.75-5.13) at US$225 (95%UI:85-520) per DALY averted compared with business-as-usual. For CXR+NAAT, the front-loaded investment of US$161m (95%UI:111-224) annually during the intervention resulted in average annual cost savings of US$12.7m (95%UI:6.7-21.4) up to 2050 compared to business-as-usual.

In the CXR-only algorithm, screening costs are lower ($350m [95%CI:251-474] vs $1,211m [95%CI:845-1,719] in CXR+NAAT), but treatment costs are much higher ($2,609m [95%CI:1,552-3,941] vs $253m [95%CI:152-393] in CXR+NAAT), due to more treatment initiations in people without TB. Reducing the cost of NAAT led to a 63% and 26% reduction in the estimated ICER for the NAAT-only and CXR+NAAT algorithms, respectively.

Conclusions: In Viet Nam, population-wide screening could achieve ambitious policy goals. Substantial front-loaded investment is followed by persistent cost savings and could be further offset by more affordable NAATs.

OA31-407-21 Community-driven TB elimination in India: Lessons from VHAI's multi-state interventions

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Background and challenges to implementation: India accounts for nearly 27% of the global tuberculosis burden, with the country's National Strategic Plan aiming to eliminate TB by 2025. Despite progress, implementation challenges remain significant — including late diagnosis, stigma, loss to follow-up, and underreporting from the private sector. In tribal and hard-to-reach areas, poor access to health services further hampers early detection and treatment adherence.

The COVID-19 pandemic disrupted essential TB services, leading to delays in diagnosis, treatment interruption, and reduced case notifications.

Intervention or response: VHAI, in collaboration with state and district health departments, implemented community-based TB prevention and care programs. The intervention focused on:

- Community sensitization and awareness through folk media, school programs, and community meetings
- Active case finding and contact tracing in underserved populations, including tribal and migrant communities
- Capacity building of frontline workers (ASHAs, ANMs, and TB Health Visitors)
- Psychosocial support and nutritional counseling to TB and drug-resistant TB (DR-TB) patients
- Strengthening private sector engagement and referral linkages
- Supporting the Nikshay Poshan Yojana by facilitating access to nutritional support

Results/Impact: The interventions led to:

- Over **40,000 individuals** reached through TB awareness & stigma-reduction campaigns
- **Improved treatment adherence**, with over **92% treatment completion rates** reported among patients supported under the program
- Enhanced community participation, with the formation of local TB champions and peer support groups
- Strengthened DOTS services in partnership with state TB cells and improved notification from the private sector by up to 30% in high-burden districts

Conclusions: This highlights the importance of community-driven and decentralized approaches to TB prevention and care. Integration with the health system, local leadership, and trust-building are key to addressing stigma and improving access to services. These successful models from high-burden and marginalized regions can inform state and national strategies as India pushes toward its 2025 TB elimination goal. Sustained investment, cross-sector collaboration, and empowering communities will be vital to end TB.

OA31-408-21 Impact of US government funding cessation on TB prevention and care: An African multicountry survey

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Background: The U.S. government has been a key contributor to global TB elimination through USAID, PEPFAR, and CDC. However, on January 20th, 2025 an executive order freezing foreign aid has led to an abrupt cessation of over 80% of USAID TB programs. This disruption poses serious risks to TB services in resource limited settings, especially in Africa.

Design/Methods: A rapid online survey was conducted in March 2025, targeting 52 National TB Programs (NTPs) in Africa. Seventeen countries (33%) responded. The survey assessed immediate and anticipated effects of U.S. funding cuts on TB care, diagnostics, staffing, implementing partners, and WHO support.

Results: Eleven (65%) countries reported immediate negative impacts, including disruption in funding for case detection, reduced diagnostic capacity, staff layoffs, and limited patient outreach and adherence support. Ten (59%) anticipated further disruption within three months, such as reduced procurement of medical supplies and weakened treatment supervision. Four (24%) countries reported reduced patient access to diagnosis and treatment. Six (35%) experienced interruptions in monitoring, evaluation, and supervision activities. TB-related training was affected in 11 (65%) countries, with refresher courses delayed and training for new staff suspended. Implementing partners in 11 (65%) countries reduced operations, downsized staff, ceased outreach, and scaled back support for decentralized services. WHO technical assistance was affected in 9 (53%) countries, with delayed consultant recruitment, reduced evaluation support, and slowed procurement.

Table 1: Effects of US funding stoppages on TB program services: responses from 17 National TB Programs in March 2025

Question	Response=YES	
	Number	(%)
Has US Government funding stoppage already affected TB care?	11	(65)
Is US Government funding stoppage likely to affect TB care in the next 3 months?	10	(59)
Has procurement of TB treatment medication been negatively affected? *	0	-
Has procurement of TB diagnostic consummables been negatively affected? *	0	-
Is patient access to TB diagnosis and treatment negatively affected?	4	(24)
Is monitoring, evaluation, recording and reporting of TB negatively affected?	6	(35)
Is support supervision of sub-national and peripheral health facilities negatively affected?	6	(35)
Is TB training within the country negatively affected?	11	(65)
Has the functionality of NTP central, provincial and district offices been negatively affected?	5	(29)
Has the NTP had to lay off any staff due to funding stoppages?	7	(41)
Are any supporting NGOs or implementing partners negatively affected by funding stoppages?	11	(65)
Is WHO country support negatively affected?	9	(53)

Footnotes: NTP = National TB Program; NGO=non-governmental organization; WHO=World Health Organization

*One country states that procurement has been partially affected

Countries: Benin, Burkina Faso, Djibouti, Eswatini (former "Swaziland"), Ethiopia, Guinea, Guinea-Bissau, Kenya, Madagascar, Namibia, Niger, Nigeria, Sierra Leone, Somalia, South Africa, Togo, Zimbabwe.

Conclusions: The sudden suspension of U.S. funding is already disrupting TB programs, threatening recent progress and increasing the risk of drug-resistant TB. Urgent action is needed to reinstate funding and protect TB services. These findings underscore the need for sustained and diversified funding to ensure resilience in TB control across Africa.

OA32 Person-centred quality care for all

OA32-409-21 Private healthcare sector-led initiative to end TB in India

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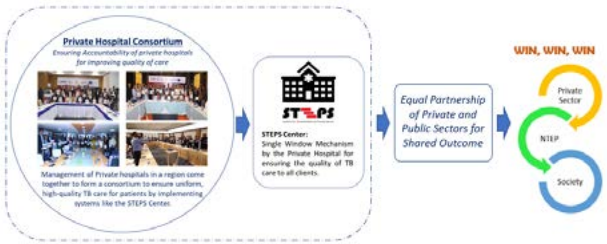
Background and challenges to implementation: In New Delhi, India, over 50% of people with presumed TB seek care from the private sector, where lack of systems for treatment adherence support often lead to sub-optimal quality of care. Limited capacity of the TB program is a challenge in reaching out to the vast number of private hospitals. Efforts to engage the private sector through an outsourced interphase agency could not be sustained throughout due to financial implications.

Intervention or response: Association of Health Care Providers of India (AHPI), a non-profit organization of private hospitals, made itself accountable to End TB. Through official letters, multiple meetings and workshops, AHPI advocated with its member hospitals to ensure standards of TB care to all clients by initiating STEPS centres as a single window system in their hospitals and follow up with their clients regularly over telephone for adherence support, counselling and contact investigations in an 'after-sales care' model. AHPI also organized the private sector in the form of three city consortiums of private hospital managements, which acted as a united front of top management of the private hospital and served as a platform for dialogue between the sectors and reviewing progress.

Figure 1: System for TB Elimination by Private Sector (STEPS) Consortium of Private Hospitals



Results/Impact: Three city consortiums were formed with 34 major hospitals with monthly meetings. 18 private hospitals in Delhi initiated STEPS and two hospitals initiated intensified case finding from OPD. TB Notification from these hospitals increased by 27% in quarter-1, 2025 as compared with the previous quarters.

Over three months, these hospitals actively supported 14,500 people with TB for treatment adherence, counselling and monthly nutritional support. Additional cost for the program per person with TB supported is estimated as 4 USD.

Conclusions: Private sector led sustainable system for ensuring standards of TB care is possible and appears to be a low-cost solution.

OA32-410-21 Longitudinal single patient viewer (SPV) usage, awareness, and training for integrated patient management in South Africa

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Background: The availability of longitudinal and cross-sectional clinical data at patient level is essential for optimal patient tuberculosis (TB)management. The Single Patient Viewer (SPV) platform, a web-based electronic health record and data access portal, offers a user-friendly and accessible platform for use by health workers (HWs).

We report on awareness, usage, uptake, and training of SPV In Cape Town, South Africa, after the implementation of data scaling initiative.

Design/Methods: We report on data from two rounds of questionnaires (2022 – 2024) among HWs from 58 public health facilities. Clinical, management, and support staff using electronic information services completed questions on SPV - Round 1 (R1) n=921; Round 2 (R2) n=871.

HWs completed surveys lasting ~10 minutes on electronic devices or online. Descriptive statistics were employed using the Software, Analytic and Descriptive Statistics Programme (SAS).

Results: SPV is essential for managing TB patient data. In R1, reported SPV awareness (368/921; 39.95%) and usage (181/921; 19.65%) was low, and only 181/368 (49.18%) of HWs aware of SPV, were using SPV. After extensive training and support efforts, in R2, there was a significant increase in SPV awareness (630/871; 72.33%) and usage (437/871; 50.17%).

Of those aware of SPV, (437/630; 69.37%) were using SPV. Users reported consistent high scores for perceived usefulness of SPV, with significant improvements in perceived SPV usefulness for lab results, drawing reports, and reportedly having the needed training t use SPV - Table 1.

Some gaps persist: 268/437 (61.33%) of HWs reported that they were not using SPV to its full capacity and 116/437 (26.54%) did not use their own login details when accessing SPV.

	R1 (%)	R2 (%)	p-value difference
SPV helps manage patients better	174/183 (95.1)	412/437 (94.3)	0.281
SPV is useful for following up on missing lab results	123/184 (66.8)	373/437 (85.4)	<0.001
SPV is useful for getting patient information from other facilities	177/184 (96.2)	422/437 (96.6)	0.616
SPV is useful for drawing reports	123/183 (66.8)	335/437 (76.7)	0.016
SPV is user friendly	146/183 (79.8)	385/437 (88.1)	0,008
Have the training needed to use SPV	85/182 (46.7)	265/437 (60.6)	0,001

Table. SPV usefulness and training: R1 vs R2.

Conclusions: Extended training and support efforts increased HW awareness and usage of SPV, allowing HWs to better use electronic systems to manage TB patients. Targeted efforts are needed to ensure user access and confidence in using this consolidated platform.

OA32-411-21 Development and validation of a TB provider trust scale: A pilot study

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Background: Provider trust towards people with TB is an important element of a positive patient-provider relationship, affects access to treatment-related interventions, and is associated with many patient outcomes, including treatment adherence and satisfaction with care.
However, existing tools that measure provider trust have not been validated for patients with tuberculosis (TB) in resource-limited settings.
Design/Methods: We developed a 28-item survey instrument to measure TB provider trust based on: previous qualitative research on patient-provider trust in Cape Town, South Africa; focus group interviews with 6 TB providers in Lima, Peru; and cognitive interviews with TB providers in Cape Town (n=10), and Lima, Peru (n=10). We pilot tested the survey with 50 TB providers (doctors, nurses, health promoters and nursing assistants) in Lima.
We conducted exploratory factor analysis (EFA) to assess construct validity, and estimated Cronbach's alpha coefficients to assess internal consistency and correlation coefficients to assess external construct validity against the TB stigma scale, perceptions of medication non-adherence, and TB attitudes and practices.
Results: Study participants had varying years of experience working in TB care: 13 (26%) for <1 year, 18 (36%) between 1-5 years, and 19 (38%) for >5 years. General trust towards people affected by TB was high (median of 8 [range, 2-10] on a scale from 1 to 10); 39 providers (78%) believed it is important for TB providers to trust their patients (rating>8). EFA suggested a three-factor model, which we interpreted as "Patient behaviours", "Provider behaviours", and "Systems and guidelines." The questionnaire and each individual question demonstrated excellent internal consistency (Cronbach's $\alpha > 0.80$) and were highly correlated with related scales.
Conclusions: The TB Provider Trust Scale may measure three distinct factors related to provider trust towards people affected by TB. The scale should be further validated in a larger scale study in various resource-limited and high-burden settings.

OA32-412-21 Measuring the efficiency of TB care in Korea's public-private mix project: A data envelopment analysis approach

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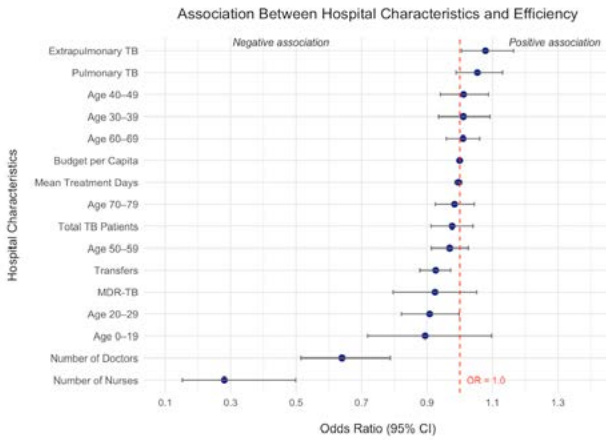
Background: A public–private mix (PPM) project for TB care was launched in South Korea in 2011 and expanded nationwide, contributing to a reduction in TB incidence from over 80 per 100,000 to 49.4 by 2020. Despite the increasing number of participating hospitals, little is known about how efficiently PPM hospitals use resources.
This study addresses that gap by evaluating institutional-level efficiency using national patient data, providing evidence to inform resource allocation and guide scale-up strategies in South Korea and other countries pursuing similar TB service models.
Design/Methods: We assessed the technical efficiency of hospital-level PPM units for TB care in South Korea from 2019 to 2023 using data from the Korea Disease Control and Prevention Agency's annual TB notification report. Patient-level data (n=113,624) were aggregated into 797 hospital-year units from 172 hospitals. An input-oriented Bootstrap DEA—appropriate in healthcare settings with complex input-output relationships—was applied, followed by logistic regression to examine institutional characteristics associated with higher efficiency based on the best-performing model.
Results: Among 797 PPM units, 29 (top 10%) were classified as efficient (efficiency score ≥ 0.9). Hospitals with more doctors (OR = 0.63, $p < 0.001$), nurses (OR = 0.27, $p < 0.001$), and patient transfers (OR =0.93, p=0.003) were

less likely to be efficient. A higher proportion of younger patients (aged 0–29) and multidrug-resistant TB cases was also associated with lower odds of efficiency. Conversely, efficiency was positively associated with treating more pulmonary/extra-pulmonary TB and serving populations (aged 30–69).



Conclusions: Efficient resource use is critical for strengthening TB care, particularly in low- and middle-income countries scaling public–private approaches. This study highlights how institutional and clinical characteristics shape efficiency, providing actionable evidence to guide resource allocation, performance monitoring, and the optimization of PPM models in Korea and other settings with constrained health system capacity.

OA32-413-21 People-centred care for culturally diverse people with drug-resistant TB in Norway: Healthcare strategies and challenges

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Background and challenges to implementation: Strategies to combat tuberculosis emphasize people-centred care, an holistic and respectful approach that addresses mental health and social well-being alongside medical goals. In Norway, most individuals who develop tuberculosis are immigrants, and special attention should be given to their psychosocial needs.

Aim: To explore the perspectives and lived experiences of culturally diverse patients with drug-resistant tuberculosis, as well as healthcare providers in hospitals and municipalities, in relation to people-centred care.
Specifically, this study aims to:
a. Explore the strategies employed to promote people-centred care.
b. Identify the challenges associated with receiving and delivering people-centred care.
Intervention or response: A qualitative study was employed, using semi-structured, individual interviews with 16 former patients with drug resistant tuberculosis and 19 healthcare providers caring for this patient group. The data was analyzed using thematic analysis.
Results/Impact: Several participating healthcare providers highlighted patients' holistic well-being during treatment, implemented strategies to help patients manage treatment and daily lives, and used interpreters to secure communication.
However, the study uncovered communication challenges and inconsistencies in healthcare across participating hospitals, within individual hospitals, and in primary healthcare settings. Some participating patients recounted adverse events, including medication error that undermined their trust in the healthcare system.
The study identified three main themes: Inconsistencies in healthcare - ranging from core components to adverse events; Knowledge and mutual understanding; Motivational strategies and support.
Conclusions: Key strategies include effective communication to foster mutual understanding, structural interventions to address inconsistencies in care, and various forms of support, including peer support.
Recognizing the impact of drug-resistant tuberculosis and an immigrant background on patients' overall well-being is essential. Barriers include poor communication, adverse events, and limited access to psychological care. Under Norwegian law, patients have the right to an interpreter, and this study reinforces the importance of this provision.

OA32-414-21 A mixed-methods evaluation of the acceptability, implementation and effectiveness of a gender-specific TB intervention in Uganda

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Background: Existing tuberculosis (TB) screening guidelines don't address men's gendered socio-behavioural barriers to TB care. We implemented a gender-specific intervention package, called IGNITE, in public health facilities in Uganda. IGNITE screened for TB using symptom-based checklist stamps, distributed TB educational materials, and introduced male-friendly TB clinics with evening opening hours, health education by male champions in "men's corners", and integrated TB, HIV, diabetes, and hypertension screening.
Design/Methods: We conducted a mixed methods evaluation of the acceptability, implementation and effectiveness of the intervention package. We did process evaluation through in-depth interviews with implementation stakeholders and patients, observations and workshops. Interviews also explored acceptability. To assess effectiveness, we compared TB notification data before (January–June 2023) and after (July–December 2023) IGNITE at intervention (Gombe and Mityana hospitals) and control (Luwero and Kiboga hospitals) sites, applying a quasi-Poisson regression model.
Results: The intervention was deemed acceptable, attributed to improved access to additional screening services and shorter waiting times. The stamps were perceived to simplify TB screening and improve documentation, while educational materials increased inquiries about TB screening services.
Intervention implementation varied, with Gombe achieving higher coverage with the stamp and integrated screening. Mityana had higher coverage with other components. Numbers of people with presumed TB increased in Gombe but declined in Mityana. Gombe's TB notifications rose by 46.3% driven entirely by male notifications (Female 0%, Male 88.4%), while Mityana reported a 36.4% increase across both genders (Female 26.3%, Male 45.1%). Notifications declined in control facilities. The intervention significantly increased TB case notification rates (RR: 1.51, 95% CI: 1.03-2.22), males had a higher notification rate than females (RR: 1.5, 95% CI: 1.23-1.83). Higher proportions of females with TB initiated treatment pre- and post-intervention (97.4%-100%) than men (91.4%-97.7%).

Quote:

I felt good because, some of them, I had never tested before like diabetes and pressure... For HIV I had last tested a year ago. But I was able to get those services at once when I was getting tested for TB. Interviewee 15, patient, male

Table: Quasi-Poisson regression analysis of the association between the intervention, sex and facility on TB case notification rates

Predictor	TB cases notified		TB case notification rate ratio (95% CI)	p-value
	No intervention	Intervention		
(Intercept)			*245.72 (169.65- 355.89)	
Intervention	781	300	**1.51 (1.03- 2.22)**	**0.038**
Female	304	116	Ref	
Male	477	184	**1.50 (1.23- 1.83)**	**< 0.001**
Gombe	82	120	Ref	
Mityana	132	180	0.79 (0.61- 1.01)	0.062
Luwero	279	-	1.10 (0.82- 1.49)	0.519
Kiboga	288	-	1.11 (0.82- 1.5)	0.492
Month	-	-	0.98 (0.95- 1.01)	0.106
♦Intervention:sexMale	-	-	1.02 (0.69- 1.49)	0.925

*Intercept is the baseline TB case notification rate

♦ Interaction term for intervention and male sex to explore how the intervention's effect varied by sex

Conclusions: The gender-specific intervention enhanced TB screening and increased notifications among men without reducing those among women.

OA32-415-21 Gender-specific predictors of TB mortality among adolescents and young adults in Kenya: A national surveillance study

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Background: Adolescents and young adults (AYA, aged 15–24 years) face unique barriers to timely TB diagnosis and treatment contributing to poor outcomes. They account for 15% of global TB notifications, with males consistently outnumbering females. Gender disparities in TB outcomes remain underexplored. This study identified sex-specific predictors of mortality in this population to inform targeted interventions.
Design/Methods: We conducted a retrospective cohort study using data from the National TB patient management system (TIBU) from 2017 to 2022. Individuals aged 15 –24 years with bacteriologically confirmed TB were included. Mortality predictors were assessed using multivariable logistic regression, stratified by sex with adjusted odds ratios (AORs) and 95% confidence intervals (CIs) calculated.

Results: Among 58,792 individuals initiated on TB treatment, 59% were male. The mortality rate was 1% among males and 2% among females. Among females, mortality was significantly associated with undernutrition (AOR: 1.83, 95% CI: 1.41–2.37, p < 0.00001) and HIV infection (AOR: 8.49, 95% CI: 6.66–10.83, p < 0.0001). Among males, multiple factors were associated with mortality, including extrapulmonary TB (AOR: 3.23, 95% CI: 1.02–10.23, p = 0.0462), previous TB history (AOR: 3.02, 95% CI: 1.50–6.07, p = 0.0019), alcohol use disorder (AOR: 4.91, 95% CI: 1.96–12.30, p = 0.0007), undernutrition (AOR: 2.40, 95% CI: 1.33–4.30, p = 0.0033), HIV infection (AOR: 6.35, 95% CI: 3.68–10.94, p < 0.0001), and treatment at a Level VI facility (AOR: 3.18, 95% CI: 1.33–7.58, p = 0.0091).
Conclusions: These findings highlight sex-specific predictors of TB mortality among young people in Kenya emphasizing the need to promote gender-responsive approaches in TB care and management. By recognizing the differing risk profiles of male and female TB patients, gender specific support systems can be designed to improve TB reduce TB related in this age group.

OA32-416-21 Understanding knowledge gaps challenges access to TB care for gender-diverse individuals in India

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Background: Tuberculosis continues to be a challenge for public health in India, affecting the most marginalized groups. Although TB affects the transgender population disproportionately, they remain excluded from mainstream efforts, with behavioural, social, and cultural factors contributing to their vulnerability.
Design/Methods: A sequential mixed-methods approach was applied. An online survey collected quantitative data from 419 participants in 17 states on Knowledge, Attitude and Practice, and health-seeking behaviour. The qualitative data was collected through interviews conducted with community leaders and stakeholders.
Results: The findings yield great revelations as regards the TB landscape within the transgender and gender-diverse community:

- TB Awareness: The study suggests a gap in knowledge as out of the survey population, 42.7% (N=179) identified TB as an airborne condition, However, only 29.1% (N=122) correctly said that it was caused by a bacterium.
- Symptoms Awareness: Although the common symptoms reported were cough, fever, weight loss, and night sweats, knowledge of symptoms varied according to gender identity.
- TB Prevalence: Transgender women had the highest prevalence (55.9%) followed by Transgender men (21.2%) within the total sample.
- Treatment Access: Overall 50.1% (N=210) faced barriers to TB services of which Transgender women - 31.3 faced the greatest difficulties.
- Difficulty in Accessing Services: Most challenges included lack of information (26.2%), discrimination (59.4%, N=249) and lack of finance. Highest care access difficulty was reported by transgender women (50.1%, N=210).
- Stigma and Discrimination: More than 60% of transgender women and Hijras were victims of stigma at healthcare facilities.

Conclusions: The community of transgender and gender-diverse persons faces a high burden of TB and also great barriers to care. Thus, community-led interventions are necessary. It would be critical for equitable TB care and the India TB elimination goal to strengthen transgender-led organizations, expand TB preventive treatment, integrate WHO's Community, Rights and Gender framework, and ensure financial support through direct benefit transfers.

OA32-417-21 Navigating dual burdens: Intersectionality of TB and social stigma among transgenders, MSM, female sex workers, and people living with HIV in India: Findings from a qualitative study

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Background: Tuberculosis (TB) continues to be a highly stigmatised condition, particularly among already marginalised groups. Transgender persons and men who have sex with men (TG-MSM), female sex workers (FSWs), and persons living with HIV (PLHIV) face dual and intersecting stigmas due to their identities and health status. This study, conducted under the STOP-TB partnership, explores TB-related stigma among these populations groups often excluded from national TB surveillance due to their 'hard-to-reach' status.
Design/Methods: Using an exploratory qualitative design, 24 in-depth interviews were conducted from November 2023 to January 2024 in Bangalore, Karnataka. Participants, recruited through community based and

non-governmental organizations, were adults from TG-MSM, FSW, and PLHIV communities, with current or past TB history.
Ethical approval was sought from competent authorities. Data were transcribed, coded using a pre-defined thematic framework, and analyzed deductively.
Results: Stigma among participants manifested in layered and compounding ways—rooted in fear of contagion, myths about transmission, moral judgment, and visible markers of difference (e.g., gender expression).
TG-MSM respondents reported acute discrimination due to high visibility and limited family or community support. Social isolation and internalized stigma led to concealment of illness, delayed care-seeking, and mental health challenges. FSWs linked TB with economic vulnerability—fearing client loss and income disruptions due to physical symptoms.
PLHIVs described stigma from both diseases as mutually reinforcing, amplifying social withdrawal and undermining treatment adherence. Across all groups, stigma limited access to nutrition, emotional support, and timely diagnosis—factors critical for successful TB treatment.
Conclusions: TB stigma among key populations is deeply rooted in socio-cultural perceptions and intersectional identities. Targeted interventions—community-led support systems, tailored IEC campaigns, and legal safeguards—are essential to mitigate stigma and ensure equitable access to TB care and support services.

OA32-418-21 Understanding TB transmission driven by alcohol sharing behaviours and venues: A comparative cross-sectional social network survey in Puducherry, India

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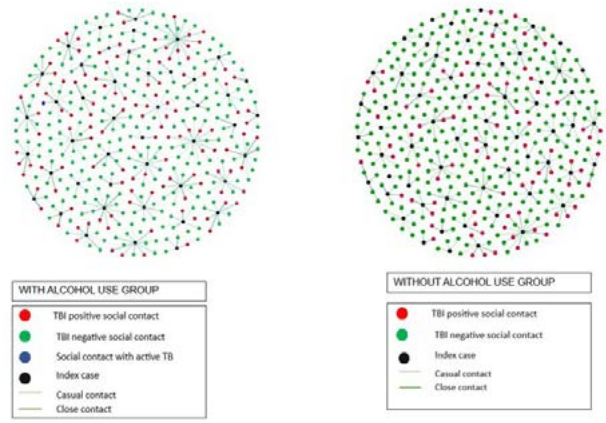
Background: Over 80% of tuberculosis (TB) transmission occurs in extra-household settings, particularly social-gatherings. The current contact tracing strategies miss to capture community transmissions networks driven by socialisation behaviours. We utilised social network survey methods to investigate the TB infection transmission and to identify individuals and congregation places with high transmission potential in Puducherry, India.
Design/Methods: We conducted a comparative cross-sectional study using egocentric sampling of 106 male pulmonary persons with TB and their social contacts with(n=355) and without alcohol use disorder. (n=358). Data on frequency of socialisation and venues were collected. All contacts were tested for TB infection using the cy-tb skin test, with an induration of ≥5 mm considered positive. Gephi software was used for network visualization and calculation of metrics: Degree Centrality (indicating how well-connected a person is) and Betweenness Centrality (indicating how individuals /venue may facilitate TB spread between groups).
Results: The contact network comprising of persons with alcohol use had 403 nodes and 358 edges, with higher average degree (1.78) and betweenness centrality (4.02), as compared to the non-alcohol network (416 nodes, 355 edges, degree: 1.7, betweenness: 2.6). Networks comprising of the alcohol sharing places showed higher betweenness (35.96) and mean path length (3.66). TB Infection rates increased with group size (16.6%, 22.2%, and 66.6 % in dyads, triads and tetrads respectively), indicating increased infection risk in more connected networks driven by alcohol use.

Figure 1. Contact Network of TB Patients with & without Alcohol Use: TB Infection Among Social Contacts



Conclusions: Social network methods helped in identifying key alcohol sharing venues and sharing individuals with high potential for TB infection transmission. Venue specific targeted screening and interventions beyond household settings could be critical for interrupting tuberculosis spread in communities.

OA33 The future of TB screening: Integrating AI, economic modelling, and community-based approaches

OA33-419-21 Ensuring diagnostic accuracy: Real-time quality control for AI-driven chest X-ray screening in resource-limited settings

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Background: Tuberculosis (TB) remains a leading cause of mortality in low- and middle-income countries (LMICs), where chest X-rays (CXRs) are widely used for screening. However, suboptimal CXR quality due to poor positioning, exposure errors, or inadequate inspiration is common and can delay diagnosis and compromise interpretation. In LMICs, ultra-portable X-ray machines have expanded access, but the lack of radiologists has accelerated adoption of computer-aided detection (CAD) tools like qXR. Without robust quality control (QC), these AI models may be forced to interpret flawed images, increasing the risk of misdiagnosis. We evaluated the performance of qXR's integrated QC module, designed to automatically detect and flag poor-quality CXR.
Design/Methods: qXR's QC module uses a deep convolutional neural network (EfficientNetB5) to detect four quality issues: clipped anatomy (incomplete lung fields), rotation, poor inspiration, and bad exposure. Trained on 28,503 CXRs, it was evaluated on 2,866 validation images, each possibly carrying multiple quality tags. The QC module runs alongside other qXR models, delivering results in 30–60 seconds.
We report area-under-the-receiver-operating-characteristic-curve (AUROC), sensitivity, specificity, and optimal thresholds for each quality issue, compared with corresponding radiologist assessments.
Results: qXR QC module achieved AU-ROC of 0.967, 0.910, 0.89 and 0.839 against clipped anatomy, rotation, poor inspiration and bad exposure in the validation dataset ensuring robust performance in detecting quality anomalies.

Quality Issue	Test Set Count	AUC	Sensitivity	Specificity	Optimal Threshold
Clipped Anatomy	998	0.967	0.92	0.93	0.184
Rotation	614	0.910	0.94	0.94	0.626
Poor Inspiration	368	0.890	0.90	0.75	0.084
Bad Exposure	886	0.839	0.78	0.76	0.428

Table 1: Performance of qXR-QC module against radiologist report stratified by each quality issue.

Conclusions: The qXR QC module is a critical safeguard for AI-based CXR interpretation in LMICs. By reliably identifying poor-quality images before CAD analysis, it reduces diagnostic errors, prevents resource waste, and provides real-time feedback for reacquisition. By reducing repeat scans and minimizing human QC reliance, this module enhances workflow efficiency and enables decentralisation of TB screening operations. This quality assurance layer enhances the integrity of automated TB screening and supports responsible AI deployment in resource-constrained settings.

OA33-420-21 Time-to-treatment-initiation studies of a randomised controlled trial in community-based active case-finding for TB

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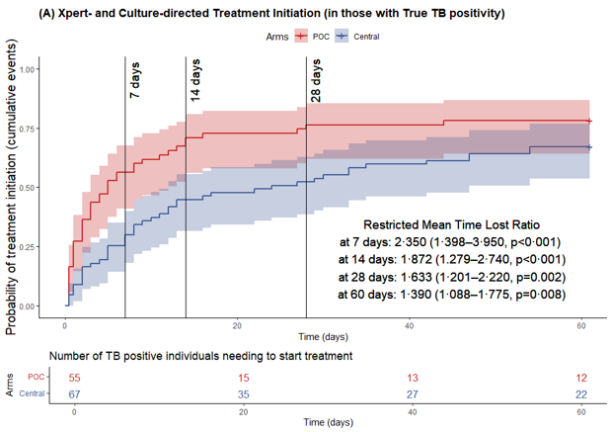
Background: Delays in tuberculosis treatment initiation fuel the TB epidemic. Active case-finding is critical to interrupt transmission and reduce burden. Here, we described the time-to-treatment initiation patterns of a randomised controlled trial for active case-finding (XACT-3).
Design/Methods: Data from the XACT-3 study were included. Briefly, participants at risk for TB received Xpert Ultra testing (randomised to Xpert performed point-of-care or centralised laboratory) and TB culture (reference). We investigated time-to-treatment-initiation in those with definite TB (culture-positive or Xpert-positive without previous history of TB) between the arms. Time analysis models adjusted for age, sex, and site were performed. Regression analysis was performed to identify independent predictors.
Results: Of 3288 at-risk individuals (POC arm, n=1643; central arm, n=1645), 122 (3·71%) were classified as definite TB. The Schoenfeld test for proportional assumptions was significant; thus, restricted mean time analyses were performed. POC Xpert was associated with faster treatment initiation within 7,14, 28 and 60 days (restricted mean time lost ratio [95% CI]: 2·350 [1·398–3·950; p<0·001], 1·872 [1·279-2·740, p<0·001]; 1·633 [1·201–2·220, p=0·002]; and 1·390 [1·088–1·775, p=0·008], respectively). POC Xpert was also associated with a shorter

time between confirmed diagnosis and treatment initiation (difference in 60-day restricted mean survival time [dRMST] -11·8 days [95% CI: -3·2 to -20·3 days; p = 0.007]). This was particularly true in those with cough or cavitary disease at baseline (60-day dRMST [95% CI]: -16·482 days [-6.063 to -26·901], p=0.002 and -16·559 days [-1.727 to -31.391], p=0.029; respectively). No clinical factors independently influenced time-to-treatment initiation.



Conclusions: Point-of-care diagnostics significantly accelerate tuberculosis treatment initiation compared to testing performed at a centralised facility, thereby reducing periods of transmissibility. These data support the integration of point-of-care diagnostics in community-based active case-finding strategies.

OA33-421-21 CAD4TB trajectory modelling in a cohort of household contacts and association with socio-demographic and clinical characteristics

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Background: Computer-aided detection (CAD) software, such as CAD4TB, is increasingly used for tuberculosis screening and diagnosis. However, its longitudinal performance in tracking disease progression remains unclear.
This study aimed to evaluate CAD4TB versions 6 (v6) and 8 (v8) over time using growth mixture modelling to identify distinct trajectories of CAD scores among individuals undergoing serial chest X-rays.
Design/Methods: ERASE-TB enrolled 2,109 tuberculosis household contacts from three countries (Zimbabwe, Mozambique, Tanzania) who were followed up 6-monthly for up to 24 months with comprehensive clinical, microbiological, and radiological assessments at each visit. Each chest X-ray was retrospectively analysed using CAD4TB v6 and v8. Growth mixture modelling was applied to identify latent group trajectories for each CAD version and association between latent groups and socio-demographic/clinical characteristics was investigated using chi-squared testing.
Results: For CAD4TB v6, four latent trajectory classes were identified: i) decreasing (median: 42.7, IQR: 36.7-45.0), ii) persistent high (median: 63.0, IQR: 44.3-81.9), iii) persistent medium (median: 42.7, IQR: 28.4-47.3), and iv) persistent low scores (median: 9.1, IQR: 3.2-19.7). In contrast, CAD4TB v8 identified three main trajectory classes: i) high to low (median: 32.9, IQR: 27.4-43.4), ii) low to high (median: 8.2, IQR: 2.8-20.4), and iii) persistent low scores (median: 3.9, IQR: 2.2-7.6). Higher-scoring trajectories for both versions were associated with older age, living with HIV, an incident tuberculosis diagnosis, increased symptom presentation, and previous TB.

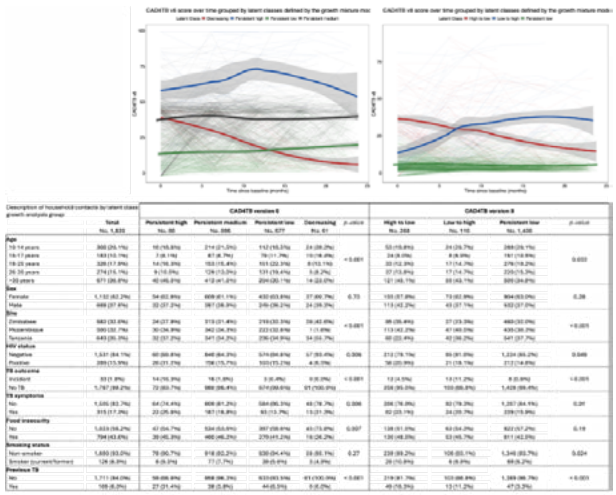

Figure 1: CAD4TB group trajectories (version 6 left and version 8 right) and association with clinical and socio-demographic characteristics.

Conclusions: Our findings suggest that CAD4TB scores exhibit distinct longitudinal trajectories, which may provide insights into disease progression.
Trajectory differences between CAD4TB v6 and v8 highlight the impact of underlying deep learning algorithms used for training.

OA33-422-21 Differentiated TB abnormality thresholds for artificial intelligence interpretation of chest X-rays

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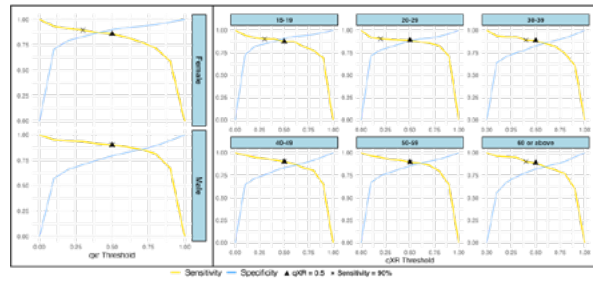
Background: Different abnormality scores are often needed to produce similar screening performance in different populations. Performance of artificial intelligence (AI) to interpret chest x-ray (CXR) may change based on different demographic characteristics and adjusting threshold scores could improve performance.
Design/Methods: We pooled 12,112 records from chest x-ray screening in Bangladesh, Nigeria, Viet Nam, and Zambia with corresponding age, sex, AI abnormality scores for TB (qXR score, qXRv3, Qure.ai), and GeneXpert result to calculate sensitivity and specificity at various qXR thresholds with GeneXpert as the reference standard. Manufacturer-recommended qXR threshold is 0.5.
Results: Overall, 7.6% had positive Xpert, 44.7% were females, and 20-29 years old, 30-39, 40-49, 50-59, and 60+ constituted 15.1%, 16.3%, 17.2%, 19.6%, and 27.4% of the population, respectively.
Most (59.3%) qXR scores were less than 0.1 and 18.6% were above 0.5. At default 0.5 threshold, pooled sensitivity was 0.89 and specificity was 0.84.
Sensitivity and specificity among females were 0.86 and 0.9, and among males 0.9 and 0.79 respectively. WHO Target Product Profile (TPP) of 90% sensitivity was achieved at gender-differentiated qXR thresholds of 0.3 (female) and 0.5 (male) respectively, with a marginal loss in specificity (0.81).
For age, 90% sensitivity was achieved at 0.3 qXR threshold for 15-19 age group, 0.2 for 20-29, 0.4 for 30-39, 0.5 for 40-49 and 50-59, and 0.4 for 60+.
There were no scenarios for sex and age groups where both sensitivity and specificity improved compared to the 0.5 threshold.



Conclusions: While differentiated abnormality threshold scores did not show improvement in both sensitivity and specificity compared to the 0.5 threshold, different thresholds were required to achieve 90% sensitivity for both sex and age groups highlighting the need to adjust thresholds based on context, target population for screening, and testing capacity.

OA33-423-21 Factors affecting the performance of chest X-ray artificial intelligence-based computer-aided diagnosis for TB in a primary health centre

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Background: Chest X-ray (CXR)-based diagnosis for tuberculosis (TB) using artificial intelligence (AI) computer-aided detection is being increasingly adopted. We assessed the diagnostic accuracy of one such AI device (qXR) and factors associated with inaccurate results.
Design/Methods: This retrospective study utilized data from people with cough presenting at a Primary Health Center in Maputo, Mozambique, to develop a cough analysis algorithm. Xpert MTB/RIF test results, CXRs, medical history, demographics, body weight and height, and spirometry results at enrollment were included in this analysis. CXRs were processed by AI. Using a microbiological reference standard based on Xpert, we calculated the area under the receiver operating characteristic curve (AUROC), sensitivity and specificity of AI. Subgroup analyses examined people living with HIV (PLHIV), people with a previous TB (PWTH), body mass index (BMI), forced expiratory volume in one second (FEV1), forced vital capacity (FVC) and FEV1: FVC ratio categories. A multivariable logistic regression model assessed factors associated with incorrect (false positive/false negative) AI results.

Group	AUROC (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
Overall (n=220)	0.92 (0.86–0.97)	92.0% (80.8–97.8)	83.5% (77.1–88.8)
PLHIV (Yes, n=55)	0.93 (0.86–1.00)	100% (71.5–100)	72.7% (57.2–85.0)
PWTH (Yes, n=41)	NA	NA	65.7% (47.8–80.9)
BMI Low (<18.5, n=51)	0.86 (0.75–0.97)	96.2% (80.4–99.9)	44.0% (24.4–65.1)
BMI Normal (n=115)	0.92 (0.82–1.00)	90.5% (69.6–98.8)	91.5% (83.9–96.3)
Low FEV1 (Yes, n=77)	0.92 (0.85–0.99)	96.0% (79.6–99.9)	75.0% (61.1–86.0)
Low FVC (Yes, n=79)	0.92 (0.86–0.98)	96.2% (80.4–99.9)	75.5% (61.7–86.2)
Low FEV1: FVC Ratio (Yes, n=12)	NA	NA	80.0% (44.4–97.5)

Results: Among 220 participants (mean age+standard-deviation: 39±14.6; 50% female) with available Xpert results, 55 (25%) were PLHIV, 41 (18.6%) PWTH, 51 (23.2%) had low BMI, 12 (5.4%) low FEV1:FVC ratio, and 50 (22.7%) had microbiological confirmed TB. AI performance AUROC: 0.92 (95% CI: 0.86- 0.97), sensitivity: 92% (80.8-97.8), specificity: 83.5% (77.1-88.8) overall. Specificity was relatively lower in PWTH (65.7%), PLHIV (72.7%), and low BMI group (44%).
Logistic regression analysis showed that low BMI, PLHIV and PWTH were independently associated with incorrect AI results ($P < 0.05$), while age, gender, FEV1, FVC and FEV1:FVC ratio did not.
Conclusions: AI met the WHO TPP criteria without threshold calibration. The likelihood of incorrect AI results was higher in those with low BMI, past TB history and HIV. More research is needed to corroborate the findings and to investigate if these subgroups will benefit from focused calibration.

OA33-424-21 Mathematical modelling of TB transmission and intervention effectiveness: Evaluating age-specific control measures across epidemiologically diverse regions in China

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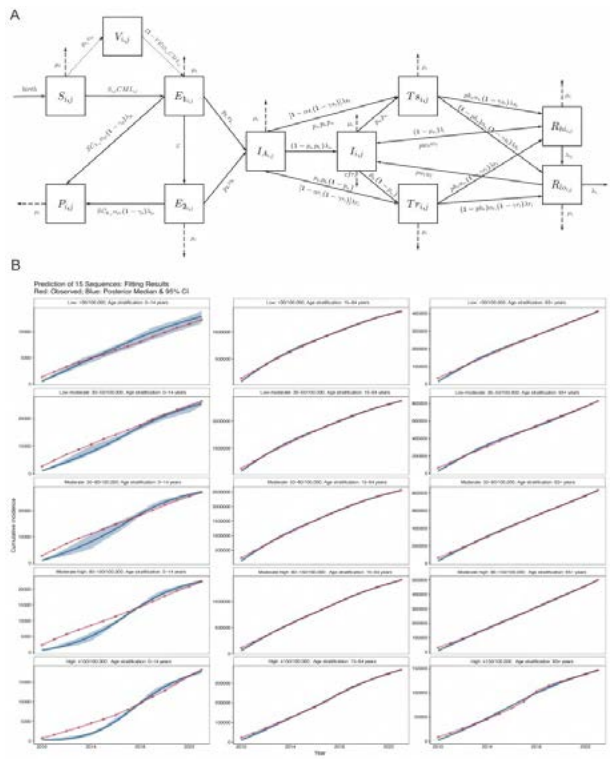
Background: Tuberculosis (TB) remains a major public health challenge in China, with 748,000 cases reported in 2022. Despite a 3% annual incidence decline, achieving "End TB Strategy"'s 2030/2035 targets demands optimized strategies. Current interventions inadequately address heterogeneous transmission across epidemiologically stratified regions.
This study employs transmission dynamics modeling to evaluate intervention effectiveness and predict TB incidence trajectories under optimized control measures.
Design/Methods: A compartmental model stratified by 3 age groups and 5 regions categorized by incidence of TB simulated TB natural history from susceptibility to previous-cases' management. Parameters derived from national surveillance, cohort studies, and literature informed transitions between compartments.
Bayesian block-adaptive Markov chain Monte Carlo (MCMC) algorithms calibrated transmission coefficients and progress rates by fitting with the number of notifications from 2010 to 2023. The effectiveness of assumed interventions varied by regions and age groups were evaluated: active cases finding, passive cases finding, patient management and novel vaccine.
Results: The model demonstrated strong concordance with empirical data across all demographic strata, as evidenced by coefficients of determination (R2) exceeding 0.85. While most populations exhibited heterogeneous temporal trajectories with progressive incidence declines post-2020, sustained transmission persisted among children under 14 years in low-to-moderate transmission zones. National projections under baseline conditions re-

vealed a 25.5% reduction in tuberculosis incidence from 40.81 (95% CI: 39.17–43.14) to 30.40 per 100,000 population between 2023 and 2035. Counterfactual analysis estimated that optimized active case-finding strategies could avert 2.40 million TB cases, surpassing passive case finding (0.49 million), patient management (0.57 million), and novel vaccine (0.22 million) at the national level, from 2025 to 2035.



Conclusions: The modeling framework demonstrates epidemiological validity with sustained TB incidence reduction under current policies. Prioritizing active case detection and strengthening pediatric surveillance could accelerate progress toward elimination targets. Continuous refinement of intervention strategies remains imperative for persistent transmission hotspots.

OA33-425-21 A Bayesian cost-effectiveness model of TB screening and diagnosis in seven high TB burden low- and middle-income countries

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Background: High costs of diagnostic tests and screening programs remain a major barrier to timely TB identification in resource-limited settings. Evidence on the cost-effectiveness of more sensitive and scalable screening and diagnostic tests is limited. The Start4All consortium is a 7-country Unitaid-funded research project aimed at developing and evaluating TB screening and diagnostic tests and test combinations (algorithms), with the goal of expanding diagnostic coverage to primary healthcare (PHC) and community settings.

Design/Methods: Five screening and diagnostic tests were evaluated: a capillary blood-based assay (C-reactive protein; CRP), sputum-based rapid molecular tests (PCR; individual and pooled), a lateral-flow urine test for lipoarabinomannan (LF-LAM), and digital chest X-rays with AI-based computer-aided detection (CAD-CXR). A microbiological reference standard of culture was used to confirm TB disease.

We compared the cost and effectiveness of concurrent and sequential positive serial algorithms of CRP, CAD-CXR, LF-LAM, and individual and pooled PCR. Performance data were used to calculate sensitivity, specificity, positive and negative predictive values, and proportions of positive results, with Bayesian conditional probability employed to estimate the accuracy of these algorithms.

Cost analysis was conducted from the provider perspective, incorporating commodity and implementation costs.

A decision tree model was developed to assess the cost per TB case detected across all countries. Probabilistic sensitivity analysis (PSA) was performed to account for uncertainty in model parameters.

Results: Preliminary results indicate that at PHC, for all adults and adults living with HIV, the sequential introduction of CAD-CXR or CAD-CXR followed by pooled PCR could reduce commodity costs by up to 66%, with a reduction in TB cases detected of up to 20% compared to algorithm with only individual PCR. PSA showed that the optimal algorithm varies depending on context, specifically decision-makers' willingness-to-pay and willingness-to-accept thresholds.

Conclusions: The scale-up of more cost-effective algorithms could lead to increased TB case detection through broader coverage.

OA33-426-21 Cost-effective diagnostic strategies for targeted mass screening campaigns: Pooled GeneXpert vs. TB-LAMP testing in Ethiopia

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Background and challenges to implementation: Mass screening and treatment (MSaT) campaigns are critical in detecting undiagnosed TB cases, particularly in asymptomatic individuals, helping to interrupt transmission and reduce disease burden. However, these campaigns are resource-intensive and logistically complex, especially in high TB burden countries like Ethiopia, where limited resources and the global economic crisis strain health systems.

This operational study compared the cost-effectiveness and diagnostic performance of two TB diagnostic tools—pooled GeneXpert and TB-LAMP testing during community-based screening campaigns in both urban and pastoralist settings.

Intervention or response: A total of 2,055 sputum samples were collected and tested using pooled GeneXpert (4:1 ratio), resulting in 514 pooled tests and 41 deconvolution tests. In parallel, 672 samples were tested using TB-LAMP to compare accuracy, throughput, and cost metrics.

The study considered both direct and indirect costs—including consumables, labor, equipment, and patient time—and calculated the unit cost per test, cost per TB case detected, and the incremental cost-effectiveness ratio (ICER).

Results/Impact: Both methods achieved 100% concordance in TB case detection. The positivity rate was 1.4% for pooled GeneXpert and 2.0% for TB-LAMP. Pooled GeneXpert testing saved 1,500 cartridges—approximately USD $15,000. The unit cost per test was $3.20 for pooled GeneXpert and $4.30 for TB-LAMP. The cost per TB case detected was $136 and $197, respectively. GeneXpert cartridge costs accounted for 47% of total test costs, while TB-LAMP consumables made up 45% of its costs. TB-LAMP demonstrated higher throughput, processing up to 112 samples/day compared to 32/day for a 4-module GeneXpert machine.

Conclusions: Both tests were diagnostically reliable, but pooled GeneXpert offered greater cost savings and efficiency. When paired with high-quality specimens, pooled testing is a novel, scalable solution for resource-limited settings. It enables broader coverage, faster results, and cost-effective TB case detection—key elements for successful MSaT campaigns and advancing toward TB elimination goals.

OA33-427-21 Cost-effectiveness of clinic-based and community-based active case finding in South Africa

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Background: South Africa is implementing targeted universal testing for TB (TUTT) in health facilities, however in the context of a global funding crisis, many programs have halted, and countries will need to reconsider the most cost-effective approaches to TB care and prevention.

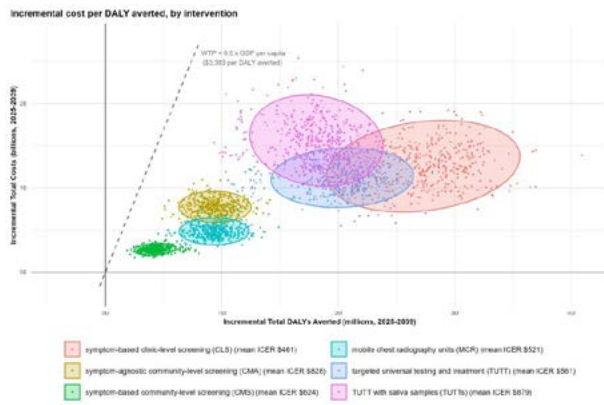
Design/Methods: We estimated the potential cost and cost-effectiveness of six case finding approaches from the provider perspective in South Africa. Scenarios included symptom-based community-level (CMS) and clinic-level (CLS) screening, symptom-agnostic community-level screening (CMA), mobile chest radiography units (MCR), TUTT using only expectorated sputum (TUTT), and TUTT allowing saliva samples (TUTTs).

Clinic-based approaches reached all clinic attendees; community-based approaches were targeted to areas with higher prevalence, reaching 10% of the population. Mtb transmission, disease development, progression, and treatment were simulated in an individual-based model.

We parameterized a cost-effectiveness model using primary and secondary cost data and estimated incremental costs and disability-adjusted life years (DALYs) for each scenario over 15 years, compared with the current standard of care. Incremental cost-effectiveness ratios (ICERs) were compared against a willingness-to-pay (WTP) threshold of $3,383 per DALY averted.

Results: All modeled interventions were under the WTP threshold and therefore likely cost-effective, with ICERs ranging from $466 (CLS) to $907 (TUTTs) per DALY averted (Figure). Targeted community-based approaches

had less coverage and were therefore cheaper but less cost-effective than clinic-based approaches. Reduced targeting would increase coverage but likely reduce cost-effectiveness. CLS and MCR were more cost-effective than TUTT; CLS was more costly and MCR was less effective overall than TUTT. There was some uncertainty in results; this did not affect overall conclusions.



Conclusions: All modeled approaches to case finding were cost-effective, but all will require additional investment. Due to the current turmoil in global aid policy, some TB programs may opt for more cost-saving options in future. This analysis provides policy-makers with a range of ACF options to consider.

OA34 From households to health systems: Innovations, ethics, and integration in TB prevention and contact care

OA34-428-21 Is household contact investigation a missing link for TB care in Chhattisgarh, India? Operational research using programmatic data

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Background: Household contact (HHC) investigation helps early identification of people with tuberculosis (TB) and initiation of TB preventive treatment (TPT) among those at high risk of developing TB. The study uses National TB Elimination Program data from Chhattisgarh, a central Indian state, to assess the coverage of HHC investigation, proportions identified with TB and put on TPT for all age groups and age<5 years. It identified predictors of HHC investigation not done among those notified for TB.
Design/Methods: This is a cross-sectional analytical study of all notified people with bacteriologically confirmed pulmonary TB and their HHCs from October to December 2023. Coverage of HHC investigation, those diagnosed with TB (among HHC) and put on TPT were calculated. Sociodemographic, clinical and health system related factors were used for finding predictors of HHC investigation not done through modified Poisson regression.
Results: Of 4221 people notified with TB, HHC investigation was done for 3177 (75%) cases. Among total11670 contacts screened, TB was diagnosed in 0.9% for all age groups and 0.7% for children<5 years. TPT was initiated in 66% for all age groups and 73% for children<5 years.
Women (adjusted prevalence risk aPR 1.10; 95%CI:1.01-1.19), those notified from non-tribal districts (aPR 1.14; 95%CI:1.01-1.29), current facility being tertiary care (aPR 1.50; 95%CI:1.12-2.00) and private (aPR 1.42; 95%CI:1.08-1.86) facility, diagnosed with test other than sputum microscopy (aPR NAAT 3.19; 95%CI:2.39-4.28;LPA 8.88 95%CI:6.15-12.82; culture 9.69; 95%CI:5.99-15.68) and for whom diabetes (aPR 1.40; 95%CI:1.16-1.70) and HIV screening (aPR 1.55, 95% CI:1.17-2.05) was missing predicted higher risk of HHC investigation not done.
Conclusions: The study highlights need to improve HHC investigation, low yield of TB and TPT initiation. Predictors of HHC investigation not done suggest a need to decentralize it to primary level and improved data-based program monitoring. A statewide capacity building initiative for improving investigation of HHC is the way forward.

OA34-429-21 Severity of TB disease in people diagnosed through systematic screening

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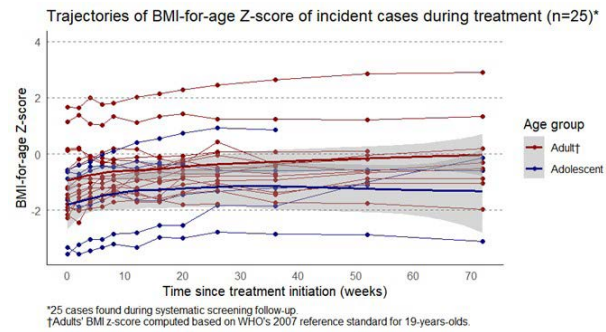
Background: Systematic tuberculosis (TB) screening aims to diagnose TB early before extensive lung damage develops and onward transmission occurs. However, there is limited data on the severity of TB among people diagnosed through screening and their recovery during treatment.
Design/Methods: As part of ERASE-TB, a TB household contact (HHC) cohort study conducted in Mozambique, Tanzania, and Zimbabwe (2021 – 2024), HHCs aged 10+ were screened for TB every 6 months for up to 2 years. The screening was chest x-ray (CXR) and symptom-based; confirmatory sputum testing used Xpert MTB/Rif and culture. HHCs with microbiologically confirmed pulmonary TB were initiated on treatment and continued to be followed for 3 years in a substudy.
Results: 35 HHCs in ERASE-TB (21 women, median age 26.6 years) were diagnosed with TB and enrolled in the substudy, 10 at baseline, and 25 during follow-up (incident). Twenty-three cases (65.7%) were symptomatic: two-thirds (n=23) reported cough (median duration 2 (interquartile range [IQR] 1.5–4.3) weeks). Other symptoms reported included weight loss (n=12 (34.3%)), fever/chills (n=12 (34.3%), and night sweats (n=6 (17.1%)). Median CAD4TB(v8) scores at diagnosis were 47.88 (IQR 13.58–86.07). There were 9 (25.7%), 15 (42.9%), and 10 (28.4%) people with semiquantitative Xpert MTB/RIF levels of very low/low, medium, and high/very high, respectively. The median time-to-culture positivity was 12.25 days (IQR 8.82–17.53). At diagnosis, the median BMI z-score was -0.87 (IQR (-1.84) – (-0.21)). BMI z-score increased steadily during treatment until week 26 (median -0.57, IQR (-1.04 – 0.07). The median time-to-resolution of cough symptoms was 4 weeks (IQR 2 - 6).



Conclusions: Most HHCs diagnosed through screening appear to have advanced disease, evidenced by at least medium Xpert MTB/Rif positivity (equivalent to smear-positive TB) and CAD4TB(v8) scores. During treatment, most HHCs saw increased BMI. A limitation of this study is the lack of a comparator group.

OA34-430-21 Breaking the chain: A community-based intervention for screening and TB preventive treatment in household contacts

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Background: Pakistan continues to bear a high burden of tuberculosis (TB), with household contacts of TB patients identified as a key population for targeted preventive interventions. Tuberculosis preventive treatment (TPT) plays a vital role in reducing the risk of disease progression; however, large-scale implementation remains suboptimal.
An intervention study was undertaken to identify and address operational challenges and inefficiencies affecting the uptake and delivery of TPT within routine programmatic settings.
Design/Methods: The intervention involved screening household contacts of TB patients diagnosed through routine programmatic services at health facilities, as well as those identified via ongoing active case finding (ACF) activities in surrounding areas.
Implemented across 61 health facilities in Pakistan during 2023–2024, the intervention followed national guidelines to determine TPT eligibility. Active TB was excluded through symptom assessment and/or chest X-ray screening. Dedicated paramedics delivered tailored health education and follow-up support.
Data were collected digitally on TPT eligibility, initiation, and completion, and were analyzed by age group to assess trends and gaps in preventive treatment uptake and adherence.

Results: A total of 23,127 household contacts were screened; 87% were eligible for TPT. Uptake was 37% overall, with initiation in 37% of adults, 34% of children aged 5–14, and 43% under five. Among those initiated, 96% completed treatment. Challenges included fear of side effects, limited risk perception, and logistical barriers. High adherence was supported by structured counseling, follow-up, and strong community trust in trained paramedical staff.

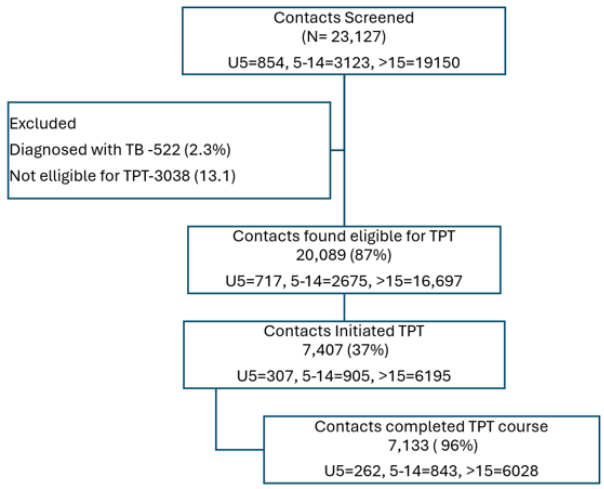

Figure 1: Results of household screening of TB contacts and uptake of TPT and completion rate in Pakistan

Conclusions: TPT delivery among household contacts is feasible with high completion rates. However, low initiation highlights the need for targeted advocacy, trust-building, and trained staff. Strengthening program readiness requires TB infection testing, minimizing out-of-pocket costs, logistical support for transport, access to chest X-rays, and robust follow-up to improve uptake and ensure equitable, sustained implementation.

OA34-431-21 Breaking barriers: Healthcare workers' perspectives on strengthening TB prevention therapy (TPT) implementation in Indonesia and the Philippines

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Background: Tuberculosis preventive therapy (TPT) is a cornerstone in global TB control. Despite strong evidence supporting its efficacy, TPT remains sub-optimal across healthcare settings due to systemic, logistical, and socio-behavioral challenges.

This study explores healthcare workers' (HCW) perspectives on the barriers to TPT implementation for people living with HIV and their recommendations for improving uptake in Indonesia and the Philippines–two high TB-HIV burden countries.

Design/Methods: We conducted ten focus group discussions (FGDs; n=52) and four in-depth interviews (IDIs) with HCWs involved in HIV/TB care between June and December 2023.

Data were analyzed using Reflexive Thematic Analysis (RTA), with Normalization Process Theory (NPT) guiding the analysis across four constructs viz. Coherence, collective action, cognitive participation and reflexive monitoring.

Results: Key barriers to TPT implementation included low awareness of recommending the TPT, inconsistent prescription practices, shortage of medicines, and limited human resources.

HCWs also highlighted the need for additional training, structured standard operating procedures (SOPs), uninterrupted TPT supply, and reminder systems to increase prescribing. There was a lack of TPT delivery reporting or other structured feedback mechanisms.

Suggested approaches to increase TPT prescribing included HCWs' training on TPT eligibility, treatment duration, understanding of regimens, side-effect management, improved communication, interdepartmental coordination, and structured patient education.

Increasing staffing and reinforcements and establishing peer support groups were proposed to mitigate operational obstacles. Embedding TPT guidelines into daily

workflows and aligning interventions with site-specific needs were also proposed to improve TPT implementation.

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Increasing staffing and reinforcements and establishing peer support groups were proposed to mitigate operational obstacles. Embedding TPT guidelines into daily workflows and aligning interventions with site-specific needs were also proposed to improve TPT implementation.

Conclusions: HCWs recognized the importance of TPT and suggested ways to improve prescribing, while noting issues with the coherence of TPT within their work environment, including inadequate support for training and lack of systematic reflexive monitoring.

Sustained investment in workforce development and inter-departmental coordination is essential for optimizing TPT delivery This highlights potential user-driven strategies for enhancing TPT prescribing.

NPT Constructs	Major themes	Illuminating Quotes	
		Factors affecting implementation	Pathways for improvements
COHERENCE	Perception and Capacity (understanding of the TPT)	"The patient really needs to take that for Tuberculosis prevention, how long is the duration, what are the possible side effects. That's it. That's as far as we were um… trained. But other than that, for example, the issues after you give the medication to the patient. Side effects, how do you explain to the patient the side effects, how it's handled? What is the level of… uh… what are the assurances that we can give the patient that it will… the benefit over their um issues, their concerns. So there, we're kind of lacking in those areas." P3-01-FG01	So far, our consultants are also DPJP [/Physician Responsible for Patients/] and our supervisors are also on standby. So, if we have any confusion, we can immediately consult. FG03-04
COGNITIVE PARTICIPATION	Clinician and Patient buy-in (willingness to engage)	I also think TPT is an important medicine, for example if patients already know its benefits, the more we know about the medicine, the more we can sell it. Drink it, drink it. That's good, you know. That's good, you know. The more we know the product, the more we can sell it – cross talk|| Lots. That's it, right? So how do we want to sell, the salespeople don't even understand the medicine. 02_FGD05_20231207_Nurses2	That means that's enough. The point is education. And if the nurse asks whether this has reached the community health center, this information is still not extensive, because the information has already reached the community health center. But even the medical team doesn't know yet, I see. So the key is understanding the medical team. FG-05-01
COLLECTIVE ACTION	Operationalization of TPT (ability and resources to deliver it)	No special training. But we have discussions – cross talk|| Discussing topics like that has been a program of our education, right? So, maybe even if there weren't any, there would be a patient every time we have authority over us, above that there is a doctor in charge. So, every time we get a case, we discuss it. Doc, there is a TPT candidate, we have discussed it too. Yes, according to this theory, what are the benefits? But for proper training –cross talk|| formal, certification has never been done. FG03-06	It can be overcome by every time after that all the doctors' type and then keep writing again that this patient has received TPT. The only thing is that there is no SOP for us to write that. Second, that is also the problem, we have a rotation system here, people change again, change again, change again, change again (talk quickly) so you can't mean as long as it's not required, you can't expect that everyone will write –cross talk|| So there is a risk that if it is a year later, the next doctor who accepts this patient will not know whether this patient has received TPT or not. FG03-01
REFLEXIVE MONITORING	Evaluating outcomes and cost-effectiveness (ability to appraise or amend) participants' reflections on the impact and effectiveness of TPT, including strategies for improvement	We just ask the patient. We do not have a paper or a card… to… for monitoring of it. Ahh, none… but, upon follow-up, we just ask.. 01-FG03-P03	Apart from cadre formation, there is also an approach to the patient's community. Actually, in my opinion, there are two of them, because they will be more than just listening to the doctor, but testimonials from other people or survivors too... in my opinion, they are also more effective to see than those that are practiced daily. So I think the collaboration is between primary health care and fellow SIDA communities too. This is also something that should be approached if you want to improve or speed up and complete this TPT program. FG03-06 (02_FGD03_20231205_Specialists)

Table 1: From Insight to Action: Themes, Participant Voices, and Implementation Pathways in the NPT Framework

OA34-432-21 Missed opportunities for HIV prevention, diagnosis and treatment in TB-affected households: Evidence from a household contact cohort study

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Background: Households affected by TB face amplified vulnerabilities due to high prevalence of co-morbidities including HIV. HIV testing of TB household contacts is recommended by the WHO however implementing this is challenging.
Design/Methods: We conducted a cross-sectional analysis of 822 people with pulmonary TB (PWTB) and 2,108 household contacts across Mozambique, Tanzania, and Zimbabwe. TB was microbiologically confirmed. Data included HIV status, ART use, and spousal relationships. HIV sero-discordance between the PWTB and their spouse was assessed.
Results: Among 822 PWTB, 30% (244/822) were people living with HIV, of whom 34% (82/244) were diagnosed with HIV at the time of their TB diagnosis. Household contacts included 373 (17.7%) spouses of PWTB.
Among the spousal pairs, HIV status was as follows: both negative (219, 59%), one living with HIV the other not (53, 14%), both living with HIV (76, 20%).
In pairs where at least one person was living with HIV, more than a quarter (53/213, 24.9%) had a partner without HIV. The PWTB was more likely to be the one living with HIV (30/106, 28%).
Of the spouses living with HIV 13 (12.1%) were diagnosed during TB contact investigations. HIV testing yield was 13.2% among spouses of PWTB with newly diagnosed HIV, 4.4% among spouses of PWTB on ART and 1.2% among spouses of HIV negative PWTB. Notably, 13.4% of PWTB not on ART had prior household TB exposure, underscoring opportunities for earlier intervention.

		HIV status of people with TB				
		Negative	Positive, on ART	Positive, not on ART	Unknown	Total
HIV status of the spouse	Negative	219 (90.5%)	20 (29.4%)	10 (26.3%)	17 (68.0%)	266 (71.3%)
	Known Positive	20 (8.3%)	45 (66.2%)	23 (60.5%)	6 (24.0%)	94 (25.2%)
	Newly Positive	3 (1.2%)	3 (4.4%)	5 (13.2%)	2 (8.0%)	13 (3.5%)
	Total	242 (100%)	68 (100%)	38 (100%)	25 (100%)	373 (100%)

Conclusions: TB diagnosis exposes systemic gaps in access to HIV care. Among spouses of ART-naive PWTB delayed diagnosis and treatment may contribute to HIV transmission. The high sero-discordance rates and HIV prevalence in these households demand urgent integration of HIV testing and prevention into TB contact investigation. Strengthening integration of TB and HIV programmes is critical to closing these gaps in high TB/HIV-burden settings.

OA34-433-21 Diagnostic performance of novel TB infection skin tests and interferon-γ release assays (IGRAs) to detect TB infection in Ndola, Zambia: A pragmatic cluster randomised trial

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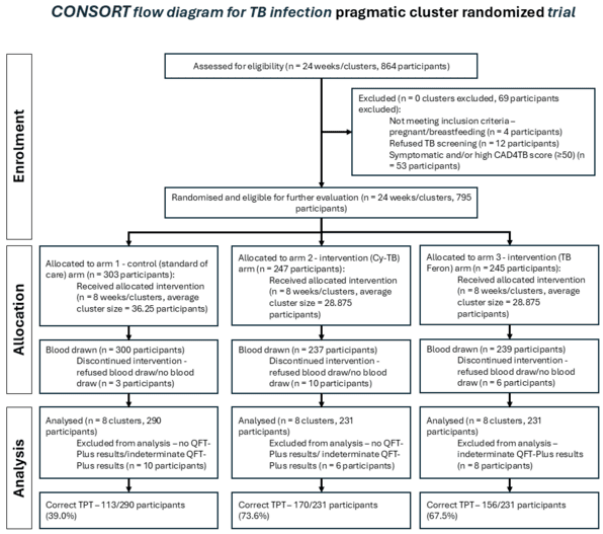
Background: TB infection (TBI) testing remains a big challenge for low-resource and high TB-burden countries such as Zambia. Recently novel TBI tests have been developed, however, more data is needed on their clinical performance, costs and effectiveness in specific populations.
Design/Methods: We conducted a three-arm pragmatic cluster-randomized trial between May-November 2024 at a primary care facility in Ndola, Zambia to determine whether novel tests for TBI would increase the proportion of individuals receiving TPT correctly. All participants were randomized to one of three arms weekly and had blood collected for QuantiFERON-TB Gold Plus (QFT-Plus) as a reference standard.
Arm one was the current Zambian standard of care where TPT is offered without TBI testing (control). TBI was ascertained using Cy-Tb™ skin test and STANDARD™ F TB-Feron FIA (IFN-gamma) test in arms two and three respectively(intervention) and TPT was offered to participants who tested positive.

We defined "correct TPT" as individuals who met national guidelines for TPT, screened negative for TB, and (1) had a positive QFT-Plus and received TPT or (2) had a negative QFT-Plus and did not receive TPT.
The primary outcome was the proportion of individuals who were managed with "correct TPT".
Results: 39.0% (32.7-45.2 95%CI) correctly started TPT in the control arm,73.6% (70.1-77.1 95%CI) in the Cy-TB arm, and 67.5% (55.2-79.9 95%CI) in the TB-Feron arm (figure). The adjusted RR for correct TPT was 1.73 (1.37–2.17 95%CI) and 1.62 (1.23–2.14 95%CI) for Cy-TB and TB-Feron arms respectively. Compared to the QFT-Plus, TB-Feron had a better clinical performance than Cy-TB at diagnosing TBI with 82% sensitivity and 86% specificity versus 65% sensitivity and 93% specificity.



Conclusions: Our study showed that the use of either Cy-TB or TB-Feron increased the chances of receiving correct TPT and reduced inappropriate TPT. This demonstrates the potential use of TB-Feron or Cy-TB as routine TBI tests.

OA34-434-21 Feasibility and acceptability of integrating TB-specific skin testing into home-based household contact investigation for TB infection in Uganda

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Background: The 2018 WHO and 2021 Uganda National Guidelines recommend expanding tuberculosis preventive therapy (TPT) eligibility to HIV-negative household contacts aged 5 years and above with confirmed TB infection. We assessed the acceptability and feasibility of integrating TB-specific skin testing (TBST) into home-based household contact investigation in Uganda.

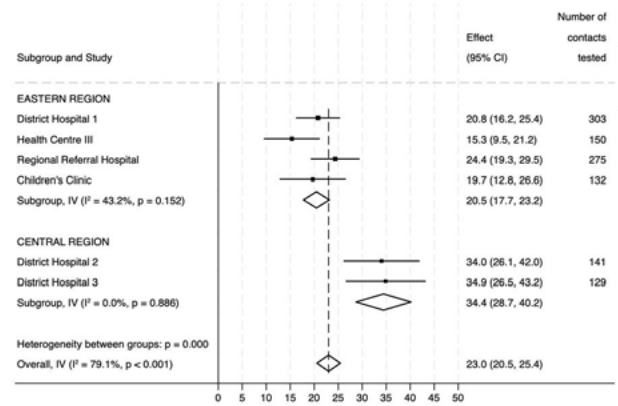

Figure 1. Forest Plot showing prevalence of TB infection by health facility.

Of 1,255 eligible contacts screened, median age was 23 years (IQR: 14–35), 58.2% (n=671) were female and most (95.2%) were household contacts. 1,153 (92%) accepted testing. Those who declined TBST (n=102) cited fear of injections (n=35), lack of symptoms (n=27), skepticism of TB infection (n=17), and concerns about skin reactions

(n=16). Only 24 contacts (2%) were unavailable for the 48–72-hour reading. Of the 1,129 contacts who completed testing, 272 (24.1%) tested positive for TB infection. The prevalence of TB infection varied regionally (ranging from 20.8% in Eastern Uganda to 34.4% in Central Uganda) and by age (ranging from 14% among children aged 8–14 to 40% among adults ≥40).

Conclusions: Integrating home-based TB-specific skin testing into routine home-based household contact investigation is both feasible and highly acceptable in Uganda. Effective scale-up will require addressing misconceptions about TB infection and fears about TST procedures to further increase acceptance.

OA34-435-21 mTST: An AI-based approach for quality assurance and measurement of tuberculin skin test administration and reading

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Background: Tuberculin skin tests (TSTs) have important limitations related to errors in administration and reading, and the need for return visits after 48-72 hours for reading. We developed an AI-based mobile application using smartphone images to measure TST administration blebs, and induration after 48-72 hours. This may enhance training and quality assurance for TST administration and reading, and reduce patient burden related to in-person TST reading.

Design/Methods: In the first phase, 86 images from a smartphone camera were used to train an AI-based mobile application, to optimize lighting, angle, distance and focus to enhance quality of image capture.

In the second phase, the app captured 20 images of injection blebs in volunteers who received varying quantities of saline injections (0.02 mL, 0.05 mL or 0.10 mL) to create small (≤7mm) or adequately sized (>7mm) injection blebs with the injection syringe in the picture.

A 4-step deterministic algorithm was used to analyze RGB channels (values of red, blue and green light) at the pixel level of the image to identify the injection bleb and edges.

Using the known SI unit dimensions of the syringe and principles of optical physics, the size of the injection site bleb was determined, and compared to manual measurement (reference value).

Results: In preliminary results the initial algorithm correctly identified 8 of 10 (80%) photos of adequate injections, and 10 of 10 (100%) photos of inadequate. The quality standardized smartphone pictures contained all the information necessary for adequate measurement of injection blebs. In the next phase of development, our algorithm will be trained to measure TST indurations to provide numerical (in mm) and categorical (significant/non-significant) results.

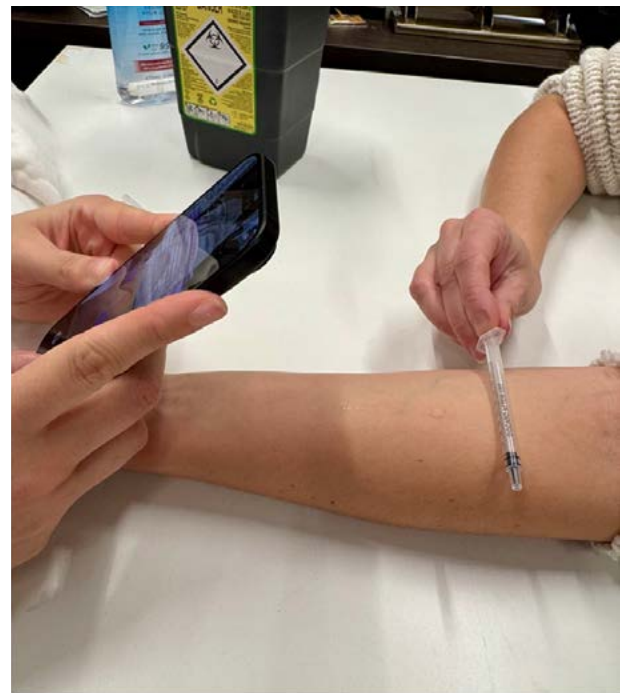

Figure 1. Image capture of injection blebs using a smartphone camera.

Conclusions: This AI-based mobile application may offer a promising solution, with the potential for global application, to reduce errors in TST administration, and minimize the need for in-person TST reading.

OA34-436-21 Beyond specificity: A bioethical frameworks essay on the ethical imperatives in choosing between PPD Rt23 and recombinant tuberculin tests

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Background: Tuberculosis (TB) remains a significant global health challenge, particularly in high-burden countries. Two major diagnostic approaches—PPD Rt23 and newer recombinant tuberculosis tests (Diaskintest/EC tests)—differ in specificity among BCG-vaccinated populations. This choice carries implications beyond technical considerations, necessitating analysis across bioethical,

philosophical, social, and geopolitical dimensions. Civil society engagement is crucial for implementing ethical diagnostic strategies that respect community values and enhance program acceptance, particularly where historical mistrust of medical interventions exists.

Design/Methods: We conducted a structured ethical analysis examining TB diagnostic strategies through multiple frameworks: (1) Principlism (autonomy, beneficence, non-maleficence, justice); (2) Capabilities approach; (3) Social justice theories; (4) Limitarian justice; and (5) Contextual analysis. Literature review synthesized evidence on biological efficacy, while systematic application of theoretical frameworks enabled evaluation of ethical implications. Community perspectives were integrated through content analysis of advocacy documents and interviews with civil society representatives from high-burden TB countries.

Results: Recombinant tests demonstrate higher specificity (92-99%) than PPD Rt23 (59-68%) in BCG-vaccinated populations while maintaining comparable sensitivity. This biological advantage aligns with ethical principles by reducing unnecessary treatment, enhancing autonomy through accurate information, and promoting justice through efficient resource utilization. The capabilities approach reveals how false positives restrict substantive freedoms, while social justice perspectives highlight community engagement as essential for implementation. Civil society participation strengthens diagnostic strategies by ensuring contextual appropriateness, mitigating stigma, and fostering community ownership—improving both ethical practice and program effectiveness.

Conclusions: Technical advantages of newer TB diagnostic tests cannot be separated from broader ethical, social, and political contexts. TB control programs should adopt integrated approaches that prioritize tests minimizing false positives, meaningfully engage civil society, contextualize strategies within local realities, apply ethical frameworks consistently, and promote health as a fundamental right. This integration guides development of TB control strategies that are technically effective, ethically robust, and socially embedded through authentic community participation.

OA35 Tiny-people, big challenges: Emerging diagnostics for paediatric TB

OA35-437-21 Chest X-ray artificial intelligence for detection of paediatric pulmonary TB: A multi-site retrospective diagnostic accuracy study from rural and peri-urban India

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Background: Chest X-ray (CXR) screening for adult pulmonary tuberculosis (PTB) using artificial intelligence (AI) devices is increasingly being adopted, but evidence in children is limited. We assessed the diagnostic accuracy of an AI device (qXR) trained on paediatric as well as adult CXRs.

Design/Methods: We retrospectively collected data from historical records of consecutive children with presumed PTB aged 6 to 15 years from four Indian facilities. Children with available data of demographics, CXRs taken within 10 days of diagnosis date and PTB diagnosis (positive/negative) were included. AI probability scores for the likelihood of PTB were obtained from each CXR.

Two reference standards were used;

1. A composite reference standard (CRS) –positive if confirmed microbiologically based on sputum-smear/Xpert/culture (confirmed PTB) or clinically (unconfirmed PTB) and negative otherwise;
2. A microbiological reference standard (MRS) -positive if microbiologically confirmed and negative otherwise.

Area-under-the-receiver-operating-characteristics-curve (AUROC), sensitivity and specificity of AI are reported along with threshold calibration analysis. A multivariable logistic regression model assessed if age, gender, contact history and previous TB history (PTBH) were associated with inaccurate AI results.

Results: Data from 367 children (mean age±standard-deviation: 10.6 ± 3.0 years; 205 (55.8%) males) was analysed. Nine (2.4%) had positive PTBH, 20 (5.4%) had contact history, 51 (13.9%) were confirmed TB and 24 (6.5%) were unconfirmed TB cases. AUROC was 0.85 (95% CI: 0.79-0.91) and 0.88 (0.82-0.94), respectively, using CRS and MRS. At 70% specificity, the sensitivity was 82.7%

(72.2-90.4) and 86.3% (73.7-94.3), using CRS and MRS, respectively. Age, gender and contact history did not affect AI accuracy, but positive PTBH was associated with inaccurate results ($P < .01$).

Table: Diagnostic accuracy results of AI in detection of paediatric pulmonary TB

Reference standard	AUROC	Sensitivity at optimal threshold [$]	Specificity at optimal threshold [$]	Sensitivity at 70% specificity	Specificity at 90% sensitivity
CRS	0.85 (0.79-0.91)	72.0% (60.4-81.8)	88.4% (84.1-91.8)	82.7% (72.2-90.4)	56.2% (50.3-61.9)
MRS	0.88 (0.82-0.94)	84.3% (71.4-93.0)	85.8% (81.4-89.4)	86.3% (73.7-94.3)	65.5% (60.0-70.7)

AI: Artificial intelligence; AUROC: Area under the receiver operating characteristics curve
CRS: Composite reference standard; MRS: Microbiological reference standard.
All numbers in parentheses indicate 95% confidence intervals (DeLong's for AUROC and exact binomial for others)
[$]Optimal threshold was determined based on Youden's index maximizing sensitivity and specificity. The optimal threshold was found to be 0.4275 for both MRS and CRS-based analysis.

Conclusions: AI had good accuracy in detecting confirmed and unconfirmed paediatric PTB using CXRs. CXRs from children with previous history of TB were more prone to have inaccurate AI results. Accuracy was not affected by age, gender and contact history.

OA35-438-21 Generation of paediatric chest X-rays with TB-related findings using deep generative models

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Background: The diagnosis of pediatric tuberculosis (TB) remains a significant global challenge due to non-specific symptoms, less specific radiological signs compared to adults, and limited annotated data. While chest X-rays (CXRs) are widely used to diagnose TB, interpretation is hindered by variable presentations and low inter-reader agreement. The lack of large, diverse pediatric CXR datasets limits the development of effective AI-based tools.

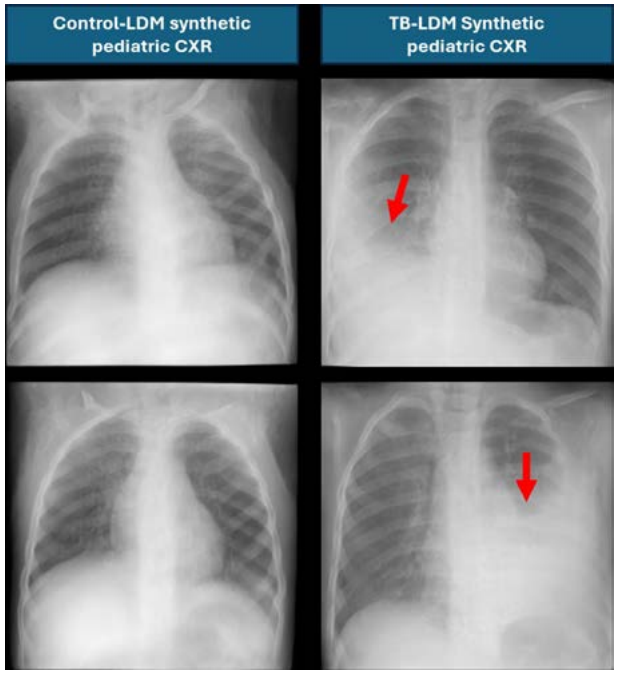
This study explores the use of deep generative models to generate realistic pediatric CXRs with TB-related findings and their impact on deep learning-based TB detection.

Design/Methods: A latent diffusion model (LDM) was trained using 592 anterior-posterior (AP) and posterior-anterior (PA) CXR images sourced from two pediatric TB cohorts: the Manhiça Health Research Center (CISM, Mozambique) and the Spanish Network of Pediatric Tuberculosis (pTBred, Spain).

We evaluated image quality using quantitative metrics such as Fréchet inception distance (FID). We then used the generated data to pre-train a convolutional neural net-

work (DenseNet121) and assessed whether the synthetic images could help improve TB detection performance on pediatric CXRs.

Results: Our approach successfully generated high-resolution (256x256) pediatric CXR images, both with TB-related findings (TB-LDM) and without (Control-LDM). Main generated findings include pleural effusion and consolidation (see figure). Quantitative evaluation showed favorable image quality, with TB-LDM scoring an FID of 143.30 when compared to adult data and an FID of 93.28 when compared to pediatric data. Pre-training a DenseNet121 on synthetic data (N=2,000) led to a 2.47% increase in area under the curve (AUC), from 0.8097 (95% CI: [0.7434, 0.8760]) to 0.8344 (95% CI: [0.7680, 0.9007]), compared to its non-pre-trained version.



Conclusions: Latent diffusion models can generate coherent pediatric CXRs with TB-related findings. These synthetic images can enhance AI model performance when used for pre-training. This approach holds promise for addressing data scarcity in pediatric TB imaging and supporting the development of more accurate diagnostic tools.

OA35-439-21 Diagnostic performance of *an optimised computer-aided diagnosis (CAD) for TB algorithm* on chest radiographs from an exclusively paediatric population in The Gambia

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Background: Diagnosis of tuberculosis in children is mostly based on clinical evaluation and chest x-ray findings. Computer-aided diagnosis (CAD) of tuberculosis algorithms have shown promise in adults but require further optimization for use in children. We assessed the diagnostic accuracy of the qXR CAD algorithm (Qure.ai) which has been further trained with dCXR images of children.

Design/Methods: We conducted a retrospective diagnostic accuracy study using dCXRs from well-characterised cohorts of Gambian children aged < 15 years with presumed pulmonary tuberculosis. The children were consecutively recruited between 2012 and 2024. We measured performance of qXR against a microbiological reference standard (MRS) and clinical reference standard (ClRS; unconfirmed-TB versus unlikely-TB), and also used Bayesian latent class analysis (LCA) to address the inherent limitations of MRS and ClRS in children. Diagnostic performance was assessed using the area under the receiver operating characteristic curve (AUROC) and point estimates of sensitivity and specificity.

Results: A total of 932 children were included in the analysis, with confirmed tuberculosis in 80 (9%), unconfirmed tuberculosis in 163 (17%), and unlikely tuberculosis in 689 (74%). Using MRS, qXR showed an AUROC of 0.68 (95%CI 0.61-0.75), with sensitivity and specificity of 54% (95%CI 43-64%) and 82% (95%CI 79-84%), respectively. Against ClRS, qXR showed an AUROC of 0.73 (95%CI 0.69-0.77), with sensitivity and specificity of 41% (95%CI 34-49%) and 87% (95%CI 84-89%), respectively.

Applying Bayesian LCA, with assumption of conditional independence between tests, qXR sensitivity and specificity were 79% (95%CrI 66-90%) and 82% (95%CrI 79-85%), respectively. Assuming conditional dependence between culture and Xpert, qXR demonstrated sensitivity and specificity of 87% (95%CrI 71-98%) and 83% (95%CrI 80-86%), respectively.

Conclusions: The optimized qXR CAD system could enhance the diagnosis of tuberculosis in children < 15 years, including those missed by conventional microbiological tests, particularly in resource-limited settings where expert radiological interpretation is scarce.

OA35-440-21 Evaluating the performance of CAD4TB software using photographs of digital chest X-rays in children with pulmonary TB

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Background: Efforts are underway to optimise computer-aided detection (CAD) models for paediatric tuberculosis (TB) diagnosis using chest X-rays (CXRs).

To support point-of-care use, we evaluated the performance of CAD4TB on photographs of digital paediatric CXRs, compared to original digital images, and explored whether image quality and artefacts affect model performance.

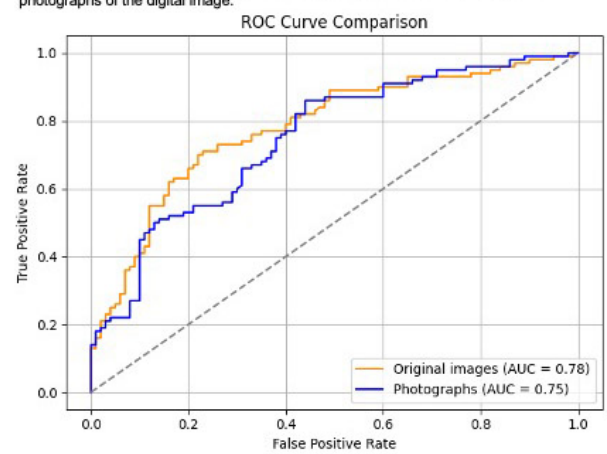
Design/Methods: We analysed 200 CXRs from children aged 0–13 years enrolled in a TB diagnostic study in Cape Town, South Africa—100 radiologically positive and 100 negative for TB, based on human radiological classification by two blinded TB experts with consensus resolution. CXR images were processed by the CAD4TBv7 modified for paediatrics (CAD4TBpTBv1) software as 1) original digital CXR image (TIFF) and subsequently as 2) photograph (JPEG) of the digital CXR on a screen using a Samsung A54 phone (camera 50 megapixels).

We generated receiver operator curves (ROC) and compared the area under the curve (AUC) between the two approaches against the same reference (human radiological classification of CXR), with significance tested via the DeLong method.

Results: The median CAD score for radiological TB images was 41.9 (interquartile range [IQR] 23.7-70.8) for the original images versus 60.6 (IQR 35.6-76.2) for the photographs of the images. For the radiological negative images the median CAD score was 14.3 (IQR 7.5-27.8) for the original images versus 29.8 (IQR 16.5-49.9) for the photographs. The AUC of the original digital CXR images was 0.78, compared to an AUC of 0.75 of the photographs (p=0.12, Figure 1).

Original images of the CXR at a set sensitivity of 90% had a specificity of 41%, compared to 40% specificity for the photographs of the images.

Figure 1. CAD4pTB comparison between original digital chest X-ray image and photographs of the digital image.



Legend: ROC curves of the original and the photographs of images using CAD4pTB software and radiological human read as reference standard. ROC= receiver-operator-curve, AUC= area under the curve.

Conclusions: The performance of paediatric adapted CAD4TBv7 was similar between photographs of digital CXRs and the original digital CXRs, supporting its potential for point-of-care use. Further model training is expected to optimise performance.

OA35-441-21 The comparison of Roche Cobas and Xpert Ultra on induced sputum to detect childhood pulmonary TB

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Background: Cobas MTB (Roche) is a moderate complexity Nucleic Acid Amplification Test (NAAT) conditionally recommended for the diagnosis of pulmonary tuberculosis (PTB). However, there are limited studies on its diagnostic accuracy, and no studies to date in children.
Design/Methods: We prospectively enrolled children (under 15 years) being investigated for PTB at Dora Nginza Hospital (Eastern Cape, South Africa) between January 2024 and February 2025. Induced sputum (IS) samples were tested with liquid culture, and either Xpert MTB/RIF Ultra (Ultra) or Cobas MTB. Children were categorised as having 'confirmed' (including Ultra trace positive), 'unconfirmed', or 'unlikely tuberculosis (TB)', according to NIH consensus definitions.
We calculated the diagnostic accuracy of Cobas MTB and Ultra in reference to a microbiological (culture-based) reference standard and a composite reference standard (CRS; TB defined as Confirmed on IS culture, or Unconfirmed TB).
Results: Of 170 children with valid culture results included, the median age was 24.2 months (IQR 12.2-47.8 months), 85 (50.0%) children were under two years old, 18 (10.6%) were living with HIV, 65/166 (39.2%) were under-weight-for-age, and 11 (6.5%) had culture-confirmed TB. Against culture, the sensitivity of Cobas MTB was similar to Ultra (66.7%; 95% CI 22.3-95.7 vs. 60.0%; 95% CI 14.7-94.7).
However, Ultra had a significantly higher yield (14/93; 15.1%) when compared to culture (11/93; 11.8%) and detected 11/93 (6.5%) additional children with culture-negative Unconfirmed TB. In comparison, Cobas MTB detected fewer cases (4/77; 5.2%) than culture (5/77; 6.5%). Against the CRS, Cobas MTB was less sensitive than Ultra (8.0%; 95% CI 2.2-19.2 vs. 23.3%; 95% CI 13.4-36.0) while specificity was 100% for both tests.
Conclusions: Cobas MTB had a lower yield and was less sensitive than Xpert Ultra for detecting culture-negative PTB in children.

OA35-442-21 Point-of-care ultrasound to support the new WHO treatment decision algorithms in the diagnosis of TB in children

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Background: Point-of-care ultrasound (POCUS) could support WHO-recommended treatment-decision algorithm (TDA) for pulmonary tuberculosis (PTB) in children in the absence of chest X-ray. We assessed the utility of POCUS to support the TDA for diagnosis of TB in children in a context with no access to chest X-ray.
Design/Methods: This cross-sectional study took place at Malakal (South Sudan), from January to December 2024. Children <10 years old with presumptive PTB were assessed with TDA and underwent blinded clinician-performed and interpreted POCUS to assess for subpleural nodules, lung consolidation, pleural and pericardial effusion, abdominal lymphadenopathy, splenic and hepatic micro-abscesses and ascites. A POCUS positive result was defined as the presence of any of these signs. Highly suggestive of TB POCUS was defined as presence of pericardial effusion, splenic micro-abscesses or abdominal lymph nodes. POCUS was not used for treatment decision or for the final TB classification of children as per the reference standard.
Results: Of 216 children enrolled (48.1% females, median age 0.9 years), 203(94.0%) were malnourished and 12(5.6%) living with HIV. The TDAs were indicative of TB treatment in 95(44.0%) children. Most common POCUS signs in patients with TB were splenic micro-abscesses (7;6.7%), lung consolidation (6;5.7%) and pleural effusion (6;5.7%). POCUS was positive in 41(19.0%) and highly suggestive of TB in 17(7.9%) children and respectively would have led to additional 14(11.6%) and 7(5.8%) children started on TB treatment among 121 children with TDA not indicative of TB. As per the reference standard, among 66 children with unlikely TB, POCUS was negative in 58(87.9%) and not highly suggestive of TB in 64(97.0%).

Conclusions: The systematic use of POCUS in addition to TDAs would lead to an increase of TB cases. Using POCUS signs highly suggestive of TB would diagnose a lower additional number of children with TB but with lower risk of overdiagnosis.

OA35-443-21 Evaluating the diagnostic accuracy of the TAM-TB assay for paediatric TB in the RaPaed-TB study

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Background: Diagnosing pediatric tuberculosis (TB) is challenging due to the paucibacillary nature of the disease and limited sensitivity of sputum-based diagnostic assays. The T cell activation marker (TAM)-TB assay, a sputum-independent blood test, measures Mycobacterium tuberculosis (MTB)-specific T-cell activation using flow cytometry and has shown diagnostic potential in previous studies.
Design/Methods: As part of the prospective study, RaPaed-TB, we evaluated a simplified TAM-TB assay using ESAT6/CFP10 peptides and CD38 assessment in children and adolescents with suspected TB under 15 years of age across five low-and-middle-income countries. Whole blood samples were collected at baseline (n=975) and up to six months post-treatment initiation. Participants were classified as confirmed TB, unconfirmed TB, or unlikely TB based on NIH guidelines.
Results: Among children with valid TAM-TB results (n=678), 25.4% (n=172) had confirmed TB, 26.8% (n=287) unconfirmed TB, and 47.8% (n=219) unlikely TB. 136 samples had invalid controls and 48 had indeterminate results. The assay demonstrated a sensitivity of 63.7% (CI: 53.6-73) using only culture-confirmed TB as a reference standard. The sensitivity dropped to 50% (CI 42.2-57.8) when using culture and/or Xpert ULTRA to confirm active TB diagnosis. The assay specificity was 95.0% (CI: 91.1-97.4 reference standard: unlikely TB). Notably, 26.1% of unconfirmed TB cases exhibited an active TAM-TB profile. TB treatment led to a significant decline in MTB-specific T cell activation ($p<0.0001$), likely reflecting reduced bacterial burden, with median CD38 expression on $IFN\gamma^+$ $CD4^+$ T-cells decreasing from 75.4% at baseline to 22.1% at Visit 4 in the confirmed TB group. 27% of confirmed TB cases remained TAM-TB positive six months post-treatment initiation.
Conclusions: These findings demonstrate high specificity of the TAM-TB assay and emphasizes its ability to detect TB, including when microbiological confirmation is negative, in a large African-Asian pediatric cohort. However, its technical complexity and the number of invalid results suggest the need for further assay refinement.

OA35-444-21 Urine lipoarabinomannan concentrations among children living with and without HIV with clinically diagnosed TB disease in KwaZulu-Natal, South Africa

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Background: Urinary LAM (uLAM) is an appealing biomarker for TB diagnosis in children because sputum collection is challenging. While testing is approved in children living with HIV (CLHIV) with a CD4 count of <200 cells/mm^3, its potential as a diagnostic for children without severe HIV (the majority of the global TB burden) has not been well characterized. Our objective was to evaluate uLAM's clinical diagnostic accuracy in children with clinical TB symptoms using highly sensitive electrochemiluminescent immunoassays (ECL-LAM) and the most accurate known LAM antibodies.
Design/Methods: We conducted a prospective longitudinal cohort study of children with clinical TB symptoms, aged 1-12 years at Harry Gwala Regional Hospital in KwaZulu-Natal, South Africa between October 2020 and May 2022, enrolling both HIV-negative children and CLHIV with a CD4 count >200 cells/mm^3. We measured uLAM concentrations using two LAM capture:detection anti-

body pairs , FIND 28:A194-01 (F/A) and S4-20:A1194-01 (S/A), and compared them to a clinical reference standard (CRS) for clinical TB diagnosis.

Results: Among the 97 children, 59.8% were female, with median age 2.6 years (IQR: 1.6-4.8). HIV prevalence was greater in CRS-positive (CRS+) children (17.6% vs 3.2%, p=0.0207). Four children had confirmed TB and thirty diagnosed clinically. F/A had a higher sensitivity compared to S/A (52.4% vs. 9.3%, p<0.0001) in CRS+ children (61.8% vs 8.8%, p<0.0001) and in children with only a clinical diagnosis (63.3% vs 6.7%, p=0.0001), but a lower specificity (49.2% vs. 94.2%, p<0.0001). The difference in median concentrations when stratified by CRS or HIV status was not significant.

		Positive by reference standard		Negative by reference standard			
Sample Type - Ab Pair (Reference Standard)	N	TP/ TP+FN	Sensitivity, % (95% CI)	TN/ TN+FP	Specificity, % (95% CI)	Positive Likelihood Ratio (95% CI)	AUC (95% CI)
Urine – F/A (Clinical Diagnosis – Primary Reference Standard[1])	97	21/34	61.8 (43.6, 77.8)	32/63	49.2 (36.4, 62.1)	1.22 (0.85, 1.74)	0.56 (0.45 – 0.66)
Urine – S/A (Clinical Diagnosis– Primary Reference Standard)	97	3/34	8.8 (1.9, 23.7)	57/63	90.5 (80.4, 96.4)	0.93 (0.25, 3.47)	0.50 (0.44 – 0.56)
AlereLAM (Clinical Diagnosis– Primary Reference Standard)	97	17/34	50.0 (32.4, 67.6)	34/63	54.0 (40.9, 66.6)	1.09 (0.71, 1.67)	0.52 (0.41-0.63)
Urine- F/A (Confirmed + Unconfirmed)[2]	97	26/45	57.8 (42.2, 0.723)	27/52	48.1 (34.0, 62.4)	1.11 (0.78, 1.60)	0.53 (0.43 – 0.63)
Urine- S/A (Confirmed + Unconfirmed)	97	6/45	13.3 (5.1, 26.8)	49/52	94.2 (84.1, 98.8)	2.31 (0.61, 8.71)	0.54 (0.48 – 0.60
AlereLAM (Confirmed + Unconfirmed	97	23/45	51.1 (35.8, 66.3)	29/52	55.8 (41.3, 69.5)	1.16 (0.76, 1.76)	0.53 (0.43 – 0.64)

[1] CRS-positive is defined as either having confirmed TB (Xpert Ultra or MGIT liquid culture positive), being clinically diagnosed by a pediatrician or initiated on TB treatment within 2 months of baseline evaluation

[2] Graham et al. (2015)'s clinical case definitions for pediatric intrathoracic tuberculosis used as secondary reference standard. These case definitions are used to standardize reporting of TB diagnostic evaluations in children.

Table 1. Diagnostic performance of the ECL-LAM F/A and S/A compared to AlereLAM performance as compared to clinical diagnosis and clinical case definition reference standards.

Conclusions: In a predominantly HIV-negative cohort of children, the diagnostic performance of ECL-LAM fell below WHO target thresholds even for a non-sputum, point-of-care test (65% sensitivity and 98% specificity). While urine may be an attractive specimen for pediatric TB diagnosis, current antibodies used for uLAM may have limited value in HIV-negative children.

SHORT ORAL ABSTRACT SESSION (SOA)

SOA14 A taste for something new: Innovative sampling for mycobacterial testing

SOA14-655-21 Evaluation of a novel tongue swab specimen for molecular TB testing on the point-of-care LumiraDx platform

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Background: Tongue swabs tested for TB on a portable rapid point-of-care (POC) molecular platform offer faster, more accessible diagnostic testing. The LumiraDx platform includes a swab preparation device and Mycobacterium tuberculosis complex test strip that provides results in <30 minutes.
We assessed whether LumiraDx MTB STAR MDx assay meets the WHO target product profile (TPP) accuracy thresholds for a non-sputum POC diagnostic (≥65% sensitivity and ≥98% specificity).
Design/Methods: Between August 2024-March 2025, we enrolled adults presenting to clinics in Pietermaritzburg, South Africa with signs or symptoms of TB disease. Tongue swabs obtained from each participant were processed, without freezing, on a LumiraDx lysis device and tested using the LumiraDx MTB and Xpert Ultra assays. Concordance between the assays (Cohen's Kappa) and diagnostic accuracy of each against sputum Ultra and MTB culture were assessed.
Results: Among 274 participants enrolled to date (65% living with HIV; 51% female; median age 38y), 15% were sputum Ultra positive (semiquantitative: 51% high/medium; 39% low/very low; 10% Trace). Compared to sputum Ultra, LumiraDx sensitivity was 61.1% [95% CI: 43.5-76.9%] and specificity 99.0% [95% CI 96.3-99.9%], with 8.8% invalid [*Table*].
Results against a microbiologic reference standard were similar. Compared to sputum culture, LumiraDx sensitivity was 64.7% [95% CI: 46.5-80.3%] and specificity 100% [95%CI: 96.8-100%], with 2.7% invalid. Differences in performance among people living with and without HIV were not significant, but performance trended by sputum Ultra semiquantitative result: >90% for 'High' to '0%' for 'Very low'. Concordance between tongue swab testing on Ultra vs. LumiraDx was almost perfect [Kappa=0.85 (95% CI: 0.74-0.97)].

Reference	Swab test	N*	Valid	n/N*	Sensitivity	n/N*	Specificity
Culture – Sputum	LumiraDx – Microbrush swab	150	146/150 (97.3%)	22/34	0.647 (0.465, 0.803)	112/112	1 (0.968, 1)
Culture – Sputum	Xpert Ultra – Copan swab	163	150/163 (92.0%)	25/35	0.714 (0.537, 0.854)	115/115	1 (0.968, 1)
Xpert Ultra – Sputum	LumiraDx – Microbrush swab	251	229/251 (91.2%)	22/36	0.611 (0.435, 0.769)	191/193	0.990 (0.963, 0.999)
	Xpert Ultra semiquantitative value		High	10/11	0.909		
			Medium	4/6	0.667		
			Low	7/11	0.636		
			Very low	0/4	0		
			Trace	1/4	0.250		
Xpert Ultra – Sputum	Xpert Ultra – Copan swab	266	248/266 (93.2%)	26/39	0.667 (0.49, 0.814)	209/209	1 (0.983, 1)
	Xpert Ultra semiquantitative value		High	11/12	0.917		
			Medium	8/9	0.889		
			Low	6/10	0.600		
			Very low	0/4	0		
			Trace	1/4	0.250		

Differences in denominators across categories of each assay are due to slight variations in population due to later start date for LumiraDx vs. Xpert Ultra tongue swab collection; delay in return of culture results, and invalid tongue swab assay results.

Conclusions: This first clinical evaluation suggests tongue swab testing on the LumiraDx platform may meet TPP thresholds for a non-sputum molecular POC test. Larger clinical validation and implementation studies are warranted to improve precision of accuracy estimates and assess impact on patient outcomes.

SOA14-656-21 Positive progress: Development of *M. tuberculosis* proficiency products for tongue swab testing protocols

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Background: Proficiency products are critical for ensuring diagnostic accuracy of *Mycobacterium tuberculosis* (MTB) detection. Universal standardizations of diagnostic evaluations will benefit from device-agnostic, thermostable, and non-infectious proficiency products. Performance verification at clinical sites will also require standardization of protocols for clinical samples and controls. A thermostable tongue swab control that provides effective performance on multiple devices and workflows would set a new standard in TB diagnostics for how devices are evaluated in the field and by the manufacturer.
Design/Methods: Cultured H37Ra MTB strain was quantified, heat-inactivated, and spiked onto dry swabs containing 30ng/swab of RNaseP and lyophilized for stability. These swabs were packaged and stored at ambient temperature for two months.
Five lyophilized control swabs were tested across devices at clinically relevant colony-forming units (CFU) per swab as follows: 500, 250, 100, 50, and 25, on four tongue

swab compatible diagnostic platforms: qPCR (25µL reactions), Xpert Ultra (Ultra), Molbio TrueNAT (Molbio), and Co-Diagnostics PCR Pro (Co-Dx).

Results: qPCR and Co-Dx detected 100% of control swabs at all tested concentrations. Ultra and Molbio detected 100% of swabs with a concentration of 50CFU/swab and higher, and 80% at 25CFU/swab. For both Ultra and Molbio, there was one invalid result at 25CFU/swab, rather than negative.

Conclusions: Lyophilized swab controls containing MTB demonstrate stable detection across a range of low concentrations on four devices following storage for two months at ambient temperatures.

Continued development of device-agnostic, shelf-stable proficiency products will enable central laboratories and point-of-care settings to share a standardized toolbox for more equivalent evaluations.

SOA14-657-21 Non-Invasive diagnosis of pulmonary TB using face mask sampling: A prospective study in adults from Moldova

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Background: Sputum-based diagnostic methods for pulmonary tuberculosis (PTB), including culture and Xpert MTB/RIF Ultra, offer high sensitivity and specificity. However, they depend on the patients' ability to expectorate sputum and may require invasive procedures such as bronchoscopy when sputum is unavailable. Therefore, we evaluated the diagnostic accuracy of face mask sampling (FMS) as a non-invasive alternative.

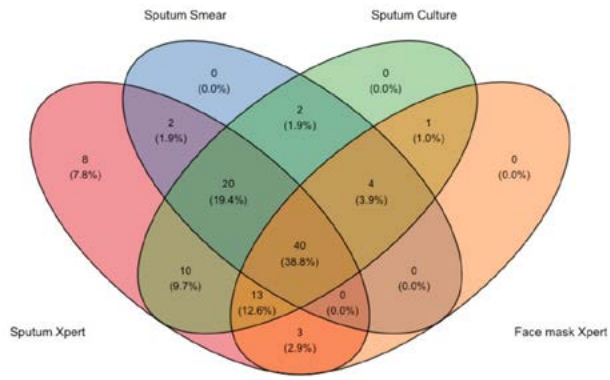
Design/Methods: In this prospective study, adult patients with suspected or recently confirmed PTB who had received less than 3 days of anti-TB treatment were recruited in Chisinau, Moldova.

Every participant received three face masks fitted with polyvinyl alcohol strips and wore each mask for 30 minutes. Samples were then analysed on site using Xpert MTB/RIF Ultra. Results were compared with those obtained from sputum microscopy, Xpert MTB/RIF Ultra, and culture.

Results: From April 2024 to February 2025, a total of 117 patients were enrolled in the study. Of these, 103 (88%) were diagnosed with PTB by sputum culture and/or Xpert MTB/RIF Ultra, with 90 testing positive by sputum culture. The sensitivity of FMS, using sputum culture as the gold standard, was 64% (95% CI: 54–74%).

Notably, among the 90 patients with a positive sputum culture, 5 cases (6%) were detected by FMS but not by Xpert MTB/RIF Ultra. Of these five FMS-positive, Xpert-negative cases, three (60%) were trace positive and two (40%) were low positive by FMS.

Among 35 (34%) patients with rifampicin resistance (RR) detected in sputum Xpert MTB/RIF Ultra, 13 (37%) also had RR detected in at least one of their face mask samples.



Conclusions: Although FMS demonstrated limited sensitivity for diagnosing PTB, it detected *M. tuberculosis* DNA in 6% of culture-positive patients who tested negative by sputum Xpert MTB/RIF Ultra.

This finding suggests that, in resource-equipped settings, FMS may serve as a valuable complementary tool for the rapid diagnosis of PTB.

SOA14-658-21 Diagnostic yield of tongue swab- compared to sputum-based molecular testing in four high-burden countries

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Background: Tongue swab-based molecular testing is emerging as a promising non-sputum option for tuberculosis (TB) diagnosis. Studies to date confirm high specificity (>98%) but lower sensitivity than for sputum-based molecular tests. We investigated whether lower sensitivity could be offset by increased sample availability, resulting in similar diagnostic yield.
Design/Methods: Between Sept 2024-Jan 2025, we screened and enrolled consecutive people with presumptive TB at clinics in the Philippines, Vietnam, Uganda, and Zambia. We offered tongue swab collection followed by routine sputum collection and TB testing (per national guidelines in each country, but primarily sputum tested with Xpert MTB/RIF Ultra [Xpert; Cepheid, USA]). Tongue swabs were tested using the novel MiniDock MTB Test (Guangzhou Pluslife Biotech, China). We compared difference in yield, defined as a positive test result, between tongue swab and sputum molecular testing using McNemar's test of paired proportions with a pre-specified margin of non-inferiority of +/- 3%.
Results: Of 1639 participants enrolled, 851 (51.9%) were female, 415 (25.3%) were living with HIV and 132 (8.1%) were children <5 years old. Overall, 1418 (86.5%) provided sputum and 38 (2.3%) provided stool for Xpert testing, while 1639 (100%) provided tongue swabs for MiniDock MTB testing. Yield was similar for tongue swabs (64/1639, 3.9%) and sputum (66/1639, 4.0%), and within the pre-specified margin of non-inferiority (difference -0.1%, 95% CI -1.0 to +0.8). Results were similar across countries. The yield of combined tongue swab and sputum testing was higher (88/1639; 5.4%) than either specimen alone.
Conclusions: TB diagnostic yield was non-inferior with tongue swab- vs. sputum-based molecular testing. Tongue swab-based molecular platforms may have an added value to enhance existing molecular diagnostic strategies, and may be considered for rapid TB testing in settings where sputum-based molecular platforms are not feasible due to cost, challenges with sputum collection, and/or infrastructure requirements.

SOA14-659-21 Test performance of tongue swabs subjected to Xpert MTB/RIF Ultra, collected from high-risk South African adult primary healthcare clinic attendees (TUTTPlus Study)

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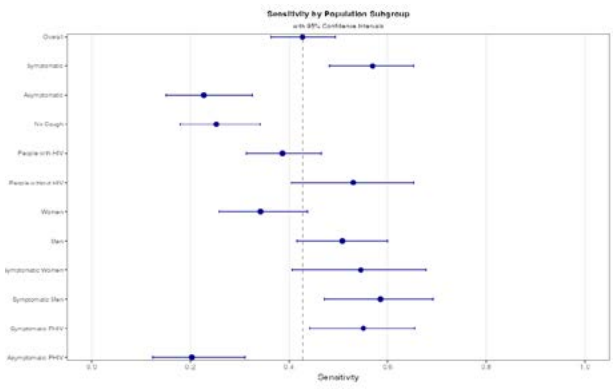
Background: Tongue swabs' ease of collection and lower nosocomial transmission risk make them an attractive tool, especially for testing sputum-scarce individuals. We report test characteristics of tongue swabs (Xpert Ultra) compared to routinely collected sputum analyzed on a molecular platform (Xpert-Ultra, MAX MDR-TB, or Cobas MTB). We recruited adults attending clinics with risk factors for TB (HIV, prior TB, close TB contact) and tested those with and without symptoms of TB.
Design/Methods: Adults with ≥1 risk factor for TB (people living with HIV, prior TB, household contact) with and without TB symptoms were tested at 10 clinics in three South African provinces with tongue swabs and sputum. We report sensitivity, specificity, positive (PPV) and negative predictive value (NPV) of tongue swabs subjected to Xpert MTB/RIF Ultra (Ultra) relative to single sputum subjected to molecular testing (Xpert-Ultra, MAX MDR-TB, or Cobas MTB).
Results: In 6568 participants with both tongue swabs and sputum results, 20% reported symptoms of TB, 70% were women, and 77% were PLWH. A single tongue swab

identified 100/238 participants with sputum-positive TB; overall sensitivity, specificity, PPV, and NPV was 43% (95% CI: 36%-49%), 99% (95% CI: 99%-100%), 82% (95% CI: 75%-88%), and 98% (95% CI: 97%-98%), respectively. Sensitivity in those with TB symptoms vs asymptomatic was 57% vs 23% (p<0.001), in men vs women was 51% vs 34% (p=0.015), and in PLWH vs without HIV was 39% vs 53% (p=0.5) (Figure).



Conclusions: Tongue swab testing demonstrated sub-optimal sensitivity and excellent specificity relative to sputum molecular testing for TB in this largely asymptomatic population of primary healthcare clinic attendees. Sensitivity was highest in men, particularly symptomatic men without HIV. Globally, men face a higher risk for TB yet lower diagnosis rates. Using a targeted testing strategy with tongue swab testing could facilitate TB detection in men, particularly in community settings outside health facilities.

SOA14-660-21 Testing tongue swab samples by Cepheid Xpert MTB/RIF Ultra: Comparison of two protocols applied to samples from people with low-bacillary load TB

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Background: Tongue swabs (TS) are an important non-sputum diagnostic specimen for TB that studies have shown to be preferred by patients and providers. While swab-specific manual extractions and qPCR protocols have yielded higher sensitivities than testing swabs by Xpert Ultra, Xpert remains desirable due to its widespread use and familiarity among providers and technicians. This project evaluated an easy-to-use protocol for analyzing TS by Xpert Ultra by using already-available reagents and no additional equipment.

Design/Methods: TS samples from symptomatic South African patients (N=313) were previously collected and tested by Xpert Ultra by a published protocol that involves heating to 100°C and addition of TE buffer. Replicate, paired samples from a subset of the same patients were tested by a new method that uses Xpert Sample Reagent (SR) diluted with PBS.
The two methods were compared to each other, and testing a single sample was compared to testing serial samples. Samples from patients with low bacillary loads were prioritized.
Results: There were 108 low-bacillary load participants for whom two TS samples were tested, one by the heating and TE method and one by the diluted SR method; 88 were TB-positive by sputum MRS and 20 were TB-negative. The heating and TE method was 42.5% (38/88; 95CI 33-54%) sensitive, while the diluted SR method was 52.3% (46/88; 95CI 41-63%) sensitive relative to sputum MRS. Both methods were 100% (20/20; 95% CI 83-100%) specific. A single sample tested by the heating and TE method was 75.5% (182/241; 95CI 70-81%) sensitive overall. Serial samples, where a TS-positive by either method was deemed positive, was 81.3% (196/241; 95CI 76-86%) sensitive relative to sputum MRS.
Conclusions: This study supports the diluted SR method for testing TS by Xpert Ultra. It is logistically advantageous and has no disadvantages in diagnostic accuracy. When feasible, serial sampling may help boost diagnostic accuracy.

SOA14-661-21 Multicentre evaluation of tongue swabs using a new molecular point-of-care assay for TB diagnosis in China

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Background: Global tuberculosis (TB) elimination efforts remain hindered by diagnostic delays. Rapid molecular point-of-care testing (POCT) offers critical advantages over conventional methods. Previous studies have shown that tongue swabs can emerge as a viable non-invasive alternative.
Therefore, combining POCT with tongue swabs may be of great value in optimizing diagnostic pathways and improving the detection rate of tuberculosis.
This multicenter study evaluates a novel molecular POCT using tongue swabs and sputum specimens in China.
Design/Methods: A total of 547 patients presenting with tuberculosis-related symptoms were recruited from four clinical sites in China. Tongue swab specimens were collected and tested using Genewise-MTBC, a rapid and fully automated POCT diagnostic system paired with microfluidic-based assay kits (Figure B).

Sputum specimens underwent smear microscopy, liquid culture, and molecular testing (Genewise-MTBC and Xpert MTB/RIF). Diagnostic performance of the tongue swab was compared with sputum microbiological reference standard (MRS) (Figure A).

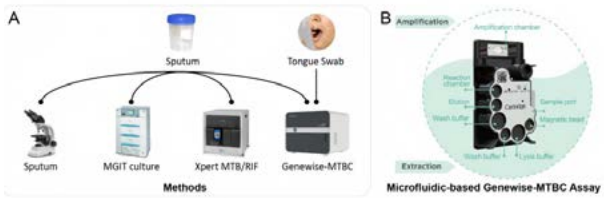
Results: Among the enrolled patients, elderly people (≥ 65 years old) accounted for 36.4%, and males accounted for 72.6%. According to the clinical diagnosis, 283 of 547 patients were diagnosed as confirmed pulmonary TB (PTB) cases.

Compared with conventional methods, sputum-based Genewise-MTBC showed superior sensitivity (94.35% vs. Xpert MTB/RIF: 88.69%, culture: 57.24%, smear: 42.05%) (Figure C).

For tongue swab specimens, the Genewise-MTBC demonstrated enhanced performance, achieving 80.85% sensitivity while retaining 100% specificity compared to MRS (Figure D).

Compared to sputum Xpert MTB/RIF, the Genewise-MTBC for tongue swabs also showed high agreement (86.85%), with sensitivity and specificity of 86.85% and 96.62%.

In addition, among the 73 smear-negative and culture-positive TB patients, the positive rate of tongue swab reached 75.3%.



C Detection results of different methods based on sputum samples

Sputum		MRS-positive		Sensitivity (95%CI)	Specificity (95%CI)	Concordance (95%CI)
		TB	Other diseases			
Smear	Positive (+)	119	3	42.05% 36.44%-47.87%	98.86% (96.71-99.61)	69.47% 65.49%-73.18%
	Negative (-)	164	261			
MGIT 960 culture	Positive (+)	162	0	57.24% 51.42%-62.87%	100.00% (98.57-100.00)	77.88% 74.21%-81.16%
	Negative (-)	121	264			
Genewise-MTBC	Positive (+)	267	0	94.35% 91.01%-96.49%	100.00% (98.57%-100.00%)	97.07% (95.30%-98.19%)
	Negative (-)	16	264			
Xpert MTB/RIF	Positive (+)	251	0	88.69% (84.47%-91.88%)	100% (98.57%-100.00%)	94.15% (91.86%-95.83%)
	Negative (-)	32	264			

D Diagnostic accuracy of tongue swabs compared with sputum MRS

Tongue Swab	Sputum MRS		Total	Sensitivity (95%CI)	Specificity (95%CI)	Concordance (95%CI)	Kappa	*P* value
	Positive (+)	Negative (-)						
Positive (+)	228	0	228					
Negative (-)	54	265	319	80.85% (75.86%-85.02%)	100% (98.57%-100%)	90.13% (87.34%-92.35%)	0.804	<0.001
Total	282	265	547					

Conclusions: Using tongue swabs and sputum specimens on Genewise-MTBC can exhibit non-inferior performance to Xpert MTB/RIF and enable decentralized implementation.

SOA14-662-21 Feasibility and diagnostic performance of tongue swab-based qPCR testing for TB in programmatic settings in Vietnam

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Background: Despite Vietnam's progress in tuberculosis case detection through its 2X strategy—chest X-ray plus Xpert Mycobacterium tuberculosis/Rifampicin—diagnostic gaps remain, especially among asymptomatic individuals and those unable to produce sputum. The high cost of scaling this strategy (~$32 million, 4.4 times the national budget) highlights the need for low-cost, non-invasive diagnostics.

This study evaluates the feasibility and diagnostic performance of tongue swab-based quantitative polymerase chain reaction testing, using individual and pooled approaches, as a complementary screening tool for TB in Vietnam.

Design/Methods: We conducted a cross-sectional study at the National Lung Hospital, Hanoi, enrolling 1,025 participants aged ≥5 years with presumptive TB.

Individuals on TB treatment or unable to provide sputum were excluded. Sputum samples were tested using Xpert MTB/RIF Ultra; tongue swabs were collected using sterile nylon-flocked swabs, processed via direct lysis, and analyzed via qPCR targeting MTB-specific genes.

We assessed sensitivity, specificity, reproducibility, and feasibility of single swab and 4-sample pooling. Assay costs were compared with Xpert.

Results: Tongue swab qPCR achieved 51% sensitivity, and 96% specificity compared to sputum Xpert, with 85.5% overall concordance.

Sensitivity was highest among high bacterial load cases (91%). Reproducibility was moderate, with 58% of positives consistent across replicates, largely due to manual processing variability.

Pooled swab testing (size 4) performed comparably to individual testing. At $5 per assay (≈$1.25 with pooling), the approach offers a significantly lower-cost alternative to Xpert ($23.46/ test).

Sensitivity	**51% (42.95%- 59.05%)**	**95% Confidence Interval**			
Specificity	**96% (94.67%- 97.33%)**	**95% Confidence Interval**			
MTB Level (Xpert MTB/RIF Ultra)	Number of samples	Percentage agreement with tongue swab tested using qPCR	95% CI	Average Ct	Average standard deviation (SD)
High	35	91%	(81.5% – 100.5%)	30.75	0.37
Medium	21	62%	(41.2% – 82.8%)	32.13	0.4
Low	60	40%	(27.6% – 52.4%)	35.04	0.67
Very Low	16	6%	(-5.6% – 17.6%)	38.03	0.76
Trace	16	31%	(8.3% – 53.7%)	37.42	1.07
Negative	798	92%	(90.1% – 93.9%)		
Overall Concordance	946	86%	(83.3% – 87.8%)		

Conclusions: Tongue swab qPCR is a feasible, low-cost TB diagnostic tool with high specificity. While improved processing is needed to boost sensitivity and consistency, early evidence supports its use—especially pooled testing for community-based screening and active case finding. As one of the first programmatic evaluations of swab on an open-PCR platform, this study highlights the potential of swab-based diagnostics to complement existing strategies and expand equitable access to TB testing.

SOA14-663-21 An ultra-high throughput tongue swab molecular testing platform (NEXAR) for mass TB screening

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Background: Breaking the *Mycobacterium tuberculosis* complex (MTBC) transmission cycle is critical, and one approach is identifying asymptomatic individuals in the community. Mass non-invasive tongue-swab (TS) collection matched with high-throughput molecular testing may provide a solution for community-based screening.
We describe a novel molecular MTBC assay developed for the ultrahigh-throughput, open-PCR NEXAR (LGC) platform.
Design/Methods: The TS lyse-to-PCR uses vortex bead-beating of TS in 400µl buffer, followed by 5µl-reaction assembly in proprietary NEXAR ArrayTape™, water-bath-based (altitude-limited to 92°C) PCR-cycling to amplify insertion sequences 6110 and 1081 and RNase P (endogenous internal control), and standardised endpoint fluorescence threshold gating. Dry TS from 992 individuals, primarily MTBC negative or with low bacillary loads by TS Xpert MTB/RIF Ultra (Ultra, Cepheid) to simulate an asymptomatic cohort, were retrieved from -80°C storage for NEXAR testing. NEXAR results were compared to TS collected dry with same-day Ultra processing (66%-diluted SR method).
Results: Reproducibility testing of control swabs (Quantigen) showed robust detection to 25CFU/swab. By Ultra TS, 877 specimens were MTBC-negative and 115 MTBC-positive, with >87% of the latter reporting Ultra semi-quantitation of low, very low or trace. HIV status was available for 379 participants (47.0% positivity). NEXAR generated 71.3% (95%CI: 61.8-79.2) positive percentage agreement (PPA) and 98.5% (95%CI: 97.4-99.2) negative percentage agreement (NPA) against Ultra TS. Stratified by HIV status, PPA increased to 81.3% (95%CI: 54.4-96.0) in HIV-negative individuals and decreased to 52.9% (95%CI: 27.8-77.0) amongst HIV-positive individuals; NPA remained >95%. Table 1 highlights increased PPA in high mycobacterial load specimens and NEXAR detection including semi-quantitative trace.

Table 1: NEXAR positivity stratified by TS Ultra semi-quantitative result

All valid results (error rate: 1.3%)			With HIV result	
Ultra TS semi-quantification	Number	NEXAR Positive n (%)	HIV positive n_{NEXAR}/n_{Ultra} (%)	HIV negative n_{NEXAR}/n_{Ultra} (%)
MTB detected high	3	3 (100%)	-	-
MTB detected medium	11	9 (81.8%)	0/1 (0.0%)	-
MTB detected low	58	50 (86.2%)	4/5 (80.0%)	8/8 (100.0%)
MTB detected very low	31	18 (58.1%)	5/9 (55.6%)	3/4 (75.0%)
MTB detected trace	12	2 (16.7%)	0/3 (0.0%)	2/4 (50.0%)
MTB not detected	877	21 (2.4%)	150/160 (93.8%)	175/185 (95.0%)

Conclusions: NEXAR testing is highly centralized and currently limited by manual front-end TS processing, but automated testing targeting 5000 tests/day is feasible. NEXAR PCR does not reach diagnostic performance of Ultra TS, but optimization (e.g. front-end sonication, alternative PCR reagents, lower altitude) may align this technology for high-throughput community screening.

SOA14-664-21 qPCR batch-processed tongue swabs as screening tool for large-scale community-based case-finding of TB

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Background: Tuberculosis (TB) case-finding and treatment-initiation with strong public-health impact can only be achieved at scale if efficient triaging for presumptive TB in large populations is feasible, fast-paced, and afford-

able. Currently, high-throughput molecular systems allow for as many as 320 tests/8 hours (e.g., Xpert Infinity-80, Cepheid), but are generally employed for processing sputum samples in high-capacity laboratories at significant cost. This study evaluated test outcomes from tongue swab samples collected from persons with known exposure to TB, transported and stored at ambient temperature, and centrally batch-processed by manual quantitative PCR (qPCR).

Design/Methods: Tongue swabs, transferred into individual 5 ml leak-free tubes containing 1.5 ml PrimeStore® Molecular Transport Medium (PS-MTM), were collected from household members exposed to persons with confirmed pulmonary TB (Xpert Ultra/culture) in Buffalo City (East London), South Africa, and airfreighted non-refrigerated in batches to Pretoria (1200 km away) once per week. Swab samples for qPCR were prepared without an extraction pre-step and analysed in triplicates using multiplex PrimeMix® MTB targeting the multi-copy IS6110 and IS1081 genes of *Mycobacterium tuberculosis* (*Mtb*). Paired sputum specimens were processed in-home by Xpert Ultra (single cartridge Omni/Edge).

Results: 98% (900/914) of eligible subjects accepted swab collection; only 32% (292/914) could provide a matching sputum sample. Invalid assay results from swab or sputum (7,9% and 8,6%, respectively) were excluded from analysis. *Mtb* was detected in 10.9% of sputums and 4.9% of tongue swabs, overall (n=269). Swab sensitivity vs. sputum (trace=negative) was 56,5% and specificity 96,7%. Importantly, an 83% concordance of swab-positive with sputum-based Xpert Ultra Medium/High results was shown (Table 1). Amongst 622 individuals without sputum samples, 3,4% were swab positive.

Tongue swab: qPCR	Sputum: GeneXpert Ultra category						Total
	High	Medium	Low	Very low	Trace	Negative	
Positive	8	2	3	0	2	6	21
Negative	1	1	6	2	6	232	246
Total	9	3	9	2	8	238	267

• Sensitivity* 56,5% (13/23); Specificity* 96,7% (238/246) [* Ultra „Trace" counted as negative]

• McNemar test on paired proportions: P = 0.8145; Difference: 0.74%; 95CI: -2.35% to 3.83%

• Concordance swab qPCR positive to sputum Ultra High/Medium positive: 83,3% (10/12)

Table 1. Results from paired sputum and tongue swab samples in PrimeStoreÒ, respectively processed by GeneXpert Ultra MTB/RIF and qPCR (PrimeMixMTB®), in household contacts of patients with confirmed pulmonary tuberculosis.

Conclusions: Tongue swabs collected in PS-MTM, shipped non-refrigerated and batch-processed centrally by affordable qPCR protocols allow for large-scale community-based case-finding that reduces time and cost associated with processing sputum and non-sputum samples individually.

SOA14-665-21 Diagnostic accuracy and feasibility of the AveloMask for non-invasive detection of pulmonary TB via breath aerosol sampling

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Background: Sputum-based diagnostics often miss tuberculosis (TB) cases due to sample collection challenges. Breath aerosols, a primary route of *Mycobacterium tuberculosis* (MTB) transmission, offer a promising, non-invasive alternative. We evaluated the diagnostic performance and usability of the AveloMask—a novel, point-of-care breath aerosol collection kit—for PCR-based detection of active pulmonary TB.

Design/Methods: We conducted a retrospective diagnostic accuracy study among symptomatic participants at primary healthcare facilities in Cape Town, South Africa. Participants wore the AveloMask for 45 minutes, with instructed deep coughing at the start and end. Aerosols were captured on a fiber-filter, stabilized in buffer, biobanked, and later tested via qPCR targeting *IS6110*. Reference standards included sputum Xpert Ultra (SXRS) alone and a composite microbiological reference standard (MRS, including culture). Usability was assessed through structured questionnaires.

Results: A total of 58/61 (95%) enrolled participants provided evaluable breath samples, of which 59% (34/58) had confirmed TB. Against SXRS, sensitivity was 71.0% (95% CI: 53.4–83.9%) and specificity 92.3% (95% CI: 75.9–97.9%). Against MRS, sensitivity was 64.7% (95% CI: 47.9–78.5%) and specificity 91.7% (95% CI: 74.2–97.7%). Sensitivity increased with sputum bacterial load, reaching 100% among those with high MTB concentrations. *IS6110* copy numbers ranged from 4–2147 (mean: 175),

indicating likely incomplete DNA-extraction. Usability feedback indicated mask and collection procedures were easy and acceptable.

Conclusions: The AveloMask demonstrated promising diagnostic accuracy for active TB, especially among individuals with higher bacterial loads, and was well-tolerated. These findings support further optimization of sample processing and validation in larger, more diverse populations and settings.

SOA15 Zero deaths? Hope dims with funding cuts

SOA15-666-21 The potential impact of reductions in international donor funding on TB incidence and mortality in low- and middle-income countries

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Background: Tuberculosis (TB) prevention, diagnostic, and treatment services in many settings rely heavily on international donor funding. In 2025, the United States Agency for International Development (USAID) was dismantled, eliminating a major source of funding to many national TB programmes. Other countries have also announced cuts to overseas development assistance.

We quantified the potential epidemiological impacts attributable to these reductions in international donor funding.

Design/Methods: We calibrated a deterministic TB model to epidemiological indicators in low- and middle-income countries.

We projected three potential future TB scenarios assuming:

a. Levels of funding in 2024 continue,

b. Termination of USAID funding from 2025, and;

c. Additional reductions in funding through The Global Fund in line with current donor announcements from 2025.

We assumed a reduction in TB treatment initiation rates proportional to budget reductions for each scenario by country, and we estimated cumulative excess incident episodes of symptomatic TB and TB deaths.

Donor	Change in funding	Excess symptomatic tuberculosis episodes		Excess tuberculosis deaths	
		median (95% UI)	% (95% UI)	median (95% UI)	% (95% UI)
Termination of funding via USAID					
United States	-100%	1 390 900 (1 113 500, 1 675 000)	1·3% (1·0, 1·7)	420 500 (335 800, 558 000)	3·8% (3·0, 4·9)
Expected change in funding via The Global Fund					
United States	-93%	2 841 700 (2 135 800, 3652 700)	2·6% (1·9, 3·6)	699 200 (505 600, 869 200)	6·0% (4·5, 7·7)
France	-37%	260 200 (196 500, 329 100)	0·2% (0·2, 0·3)	63 100 (46 200, 77 900)	0·6% (0·4, 0·7)
Germany	-24%	125 800 (95 000, 159 100)	0·1% (0·1, 0·2)	30 500 (22 400, 37 700)	0·3% (0·2, 0·3)
United Kingdom	-40%	207 900 (157 000, 263 000)	0·2% (0·1, 0·3)	50 500 (36 900, 62 300)	0·4% (0·3, 0·6)
Japan	+17%	-79 700 (-100 700, -60 200)	-0·1% (-0·1, -0·1)	-19 400 (-23 900, -14 200)	-0·2% (-0·2, -0·1)
Canada	-26%	103 300 (78 000, 130 600)	0·1% (0·1, 0·1)	25 100 (18 400, 30 900)	0·2% (0·2, 0·3)
European Commission	-35%	109 200 (82 500, 138 100)	0·1% (0·1, 0·1)	26 500 (19 400, 32 700)	0·2% (0·2, 0·3)
Sweden	-10%	12 000 (9 000, 15 100)	0·0% (0·0, 0·0)	2 900 (2 100, 3 600)	0·0% (0·0, 0·0)
Norway	-12%	10 100 (7 600, 12 800)	0·0% (0·0, 0·0)	2 500 (1 800, 3 000)	0·0% (0·0, 0·0)
Italy	+15%	-12 000 (-15 200, -9 100)	0·0% (0·0, 0·0)	-2 900 (-3 6, -2 1)	0·0% (0·0, 0·0)
Netherlands	-29%	22 700 (17 100, 28 600)	0·0% (0·0, 0·0)	5 500 (4 000, 6 800)	0·0% (0·0, 0·1)
Australia	-3%	2 300 (1 800, 2 900)	0·0% (0·0, 0·0)	600 (400, 700)	0·0% (0·0, 0·0)

Results: We modelled 79 countries, representing 91% of global TB incidence and 90% of global TB mortality in 2023. Our modelling suggested that the termination of USAID funding may lead to 420 500 excess TB deaths by 2035. Further reductions in funding through The Global Fund in line with current announcements by the United States, France, the United Kingdom, and Germany may lead to an additional 699 200, 63 100, 50 500, and 30 500 TB deaths, respectively. Excess deaths are projected to be greatest in the African region and in low-income countries.
Conclusions: We estimate substantial impacts on TB morbidity and mortality due to reductions in international donor funding. Expanded support from domestic and international donors is essential to address immediate gaps in prevention, diagnosis, and treatment.

SOA15-667-21 Why are people with TB dying?

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Background and challenges to implementation: Namibia has a high TB burden, ranked under top 10 globally. Despite standard TB patient management, the country continues to report high TB deaths, with a current 7.2% TB fatality rate among treated patients, exceeding the national target. To address this, an Quality Improvement initiative was introduced to investigate factors, situations, or conditions that may have contributed to each TB death. Early findings on the causes of TB mortality in Namibia are reported here.
Intervention or response: A multidisciplinary team conducted TB mortality audits at the district level for every TB death from 2022 to 2023. These included facility-based mortality assessments and community-based death reviews, with teams discussing causes and proposing remedial interventions. Data were recorded electronically.
Results/Impact: Of the 496 of the TB deaths audited, 309 (62%) were males. Mean age was 48 years (range <1 year to 103 years).
The majority of 450 (91%) patients had drug-susceptible TB and 379 (76%) were new cases. A significant number (192; 39%) were clinically diagnosed, of which 99 were pulmonary. There was an equal number of HIV infected and uninfected at 238 (48%) and 20 (4%) with an unknown HIV status.
Of those with HIV, majority (166; 70%) were receiving antiretroviral therapy (ART), 26 had interrupted, 39 had no ART at all and 7 had unknown ART status.
The primary cause of death was deemed to be non-TB in 145 (29%) patients, with HIV-related immunosuppression, old age, kidney injury, liver disease, and accidental deaths topping the list. For direct TB deaths, the key contributors were late presentation, HIV-related immunosuppression, and complicated extrapulmonary disease.
Conclusions: Mortality audits are essential in pinpointing preventable and systemic factors that lead to TB deaths, offering a chance to enhance systems and progress towards the End TB goals. We propose integrating mortality audits into TB program service delivery.

SOA15-668-21 TB associated mortality rate and case fatality ratio in India: A scoping review

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Background: TB is the deadliest infectious disease, killing more than malaria and HIV combined. India is the country with the highest burden of TB, accounting for around 30% of global new TB patients and 5,00,000 deaths annually. To strengthen estimates of the burden of mortality due to TB in India, we sought to collate all of the available evidence available from country-specific studies.
Design/Methods: We performed a scoping review of articles published since 2006 in PubMed and included data from cohort (prospective or retrospective) and cross-sectional studies including, but not limited to, studies of treatment cohorts.
The pooled estimates for mortality rate and case fatality ratio were obtained using random effect modelling. For estimating the case fatality ratio, the data reported in India TB report is also used.
Results: We included four studies reporting TB mortality rate and five studies reporting case fatality ratio. The population of selected studies were inclusive of general, rural and tribal population and private sector with varying age limits.
There was substantial heterogeneity between the studies, indicated by I^2>95% for both mortality rate and case fatality ratio, underscoring the variability in TB epidemiology across regions and populations. We did not do a subgroup analysis for TB mortality as the number of studies

included were small. The mortality rate was estimated as 69.6 (95% CI: 22, 213) per 100,000 population. The overall case fatality ratio was estimated as 4.8% (95% CI: 4% – 5.6%).
However, the subgroup analysis showed higher case fatality ratio (>7%) in patients under retreatment which include relapse, failure and treatment after default.
Conclusions: The high mortality and case fatality rates indicate the need for further strengthening of surveillance and conducting more well-designed studies to provide deeper insights into the dynamics of TB mortality, to support in designing tailored interventions to reduce the disease burden in India.

SOA15-669-21 Sex differences in risk factors for unsuccessful TB treatment outcomes: A retrospective cohort study of six Eastern European countries, 2020-2022

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Background: Addressing sex differences in health and disease is essential for achieving universal health coverage. However, studies on the association between sex and unsuccessful tuberculosis treatment outcomes have shown conflicting results. This study examines this association and analyses sex-stratified risk factors associated with unsuccessful outcomes.
Design/Methods: This retrospective, observational cohort study analysed prospectively collected data from six Eastern European countries from 2020-2022. The data used were obtained from the 'TB Portals' database maintained by the National Institute of Allergy and Infectious Diseases. Treatment outcomes were defined using World Health Organization criteria.
Uni- and multivariable logistic regression models were used to assess the association between sex and unsuccessful outcomes ('treatment failure', 'lost to follow-up', 'died', or any of these). After propensity score matching females and males, the multivariable analysis was repeated. Risk factors were analysed separately for each sex and compared using interaction terms.
Results: Among 1,490 females, 19% (95%CI: 18, 22) achieved an unsuccessful treatment outcome, compared with 30% (95%CI: 29, 31) among 4,553 males. In the multivariable analyses, female sex was associated with 32% lower odds of any unsuccessful outcome (adjusted odds ratio [aOR] 0.68, 95%CI: 0.58, 0.80), 36% lower odds of dying (aOR 0.6, 95%CI: 0.5, 0.8), and 37% lower odds of treatment failure (aOR 0.6, 95%CI: 0.5, 0.9). The association between sex and being 'lost to follow-up' was not significant. In the propensity score-matched cohort, sex was not associated with unsuccessful outcomes. Risk factors for unsuccessful outcomes were similar for females and males, except that in females aged > 65 years, where the odds of death were 2.2 times higher (95%CI: 1.1, 4.4).
Conclusions: Male sex was associated with worse outcomes but adjusting for clinical and socio-demographic factors attenuated the association, suggesting behavioural rather than biological drivers. Prospective studies are needed to confirm these findings.

SOA15-670-21 Key determinants of loss to follow-up and mortality among people with multi-drug-resistant TB in Papua New Guinea: A multi-province analysis

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Background and challenges to implementation: Multidrug-resistant tuberculosis (MDR-TB) patients in Papua New Guinea (PNG) experience unacceptably high rates of loss to follow-up (LTFU) and mortality, particularly in provinces with limited programmatic support. Identifying contributing factors is critical to inform targeted interventions.
Intervention or response: With the aim of assessing key demographic, clinical, and programmatic determinants of LTFU and mortality among MDR-TB patients across selected provinces in PNG, we conducted a retrospective review of 303 MDR-TB patient records from eight conveniently selected provincial TB management units (TBMUs), comprising both Global Fund (GF)-supported and non-GF-supported provinces. Of these, 171 were LTFU and 132 died during treatment in 2022. Variables analyzed included age, sex, residence, HIV status, site of disease, timing of adverse outcome, and type of treatment support. Statistical significance was assessed using chi-square tests ($p<0.05$).

Results/Impact: Most LTFU (72%) and deaths (70%) occurred among patients aged 15–45 years (p=0.006). Rural village residence was strongly associated with adverse outcomes (LTFU: 84%, deaths: 66%, p=0.00035). LTFU was most frequent in the first two months (32%) and after four months (33%) of treatment (p=0.0026). Absence of treatment support was a critical factor: 21% of LTFU and 59% of deaths had no support (p<0.00001).
Patients in non-GF-supported provinces—without community treatment supporters (CTS), transport or food support—accounted for the highest adverse outcome rates. HIV positivity was significantly associated with mortality (20% of deaths, p=0.0000065). Sex and site of TB disease were not statistically significant predictors.
Conclusions: Rural residence, lack of treatment support, younger adult age, and HIV-positive status are key determinants of adverse outcomes among MDR-TB patients. Urgent investment is needed in community-based support, patient enablers, and targeted interventions in under-resourced provinces to improve treatment outcomes.

SOA15-671-21 Treatment outcomes and post-treatment mortality among adults with drug-resistant TB in Sierra Leone: A national prospective cohort study

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Background: Multidrug-/rifampicin-resistant tuberculosis (MDR/RR-TB) is a global health threat. We evaluated programmatic outcomes and mortality post-treatment success among people with MDR/RR-TB in Sierra Leone, investigating factors associated with adverse outcomes.
Design/Methods: A prospective cohort study of individuals with microbiologically-confirmed MDR/RR-TB managed in Lakka Hospital, Freetown from 2017 to 2022 was undertaken. Treatment predominantly mirrored the World Health Organization (WHO) 2019 short (9-11 months) or long (18-24 months) or the all-oral regimens. Routinely collected data characterised baseline demographic and social, health, and disease-related factors, and treatment outcomes.
Participants were followed 12-months post-treatment completion to ascertain long-term mortality. A directed acyclic graph informed logistic regression, calculating adjusted odds ratios (aOR) and 95% confidence intervals (95%CI) to explore factors associated with adverse programmatic outcomes (National Leprosy and TB Control Program registered death before/during treatment, or loss to follow-up "LTFU") and post-treatment mortality.
Results: 739 people with MDR/RR-TB were included with a median age of 34-years (IQR: 25-45), 70% (517/739) male, 22% (160/734) HIV-positive and 60% (439/729) underweight. Overall, 78% (578/739) achieved programmatic success, 18% (134/739) died, and 3.7% (27/739) LTFU.
Demographic and social factors associated with adverse programmatic outcomes were ≥45-years (aOR=1.9;95% CI=1.1-3.2) and unemployment (aOR=2.9;95% CI=1.8-4.8). Health-related factors were HIV-positive (aOR=1.8;95% CI=1.1-2.7), chronic lung disease (aOR=1.7;95% CI:1.0-2.9), renal impairment (aOR=4.8;95% CI=1.8-12.9) and other co-morbidities (aOR=2.8;95% CI=1.2-6.8). Disease-related factors were underweight (aOR=1.6;95% CI=1.1-2.4), long treatment regimen (aOR=2.0;95% CI:1.3-3.2) and pneumothorax, effusion, or consolidation on chest radiograph.
Among people with programmatic success, 9.9% (57/578) were known to have died during 12-month follow-up. Post-treatment mortality was associated with smoking (aOR=2.7;95% CI=1.3-5.5), HIV-positive (aOR=2.0;95% CI:1.0-3.9), chronic lung disease (aOR=2.2;95% CI:1.1-4.7), previous TB episode LTFU (aOR=3.1;95% CI=1.1-8.7), and severe radiological disease (aOR=2.4;95% CI=1.2-4.5).
Conclusions: Despite effective treatment provision our results indicate high adverse outcomes among people with MDR/RR-TB in Sierra Leone underscoring the urgent need for holistic, person-centred interventions extending beyond active TB treatment, and providing an evidence base for their design.

SOA15-672-21 Unmasking the impact of COVID-19 on TB mortality in Brazil: A Bayesian structural time series analysis with implications for future health crises

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Background: The COVID-19 pandemic disrupted tuberculosis (TB) control, particularly in high-burden, socially unequal settings such as Brazil. Service interruptions and reduced healthcare access likely affected mortality trends. This study assessed the causal impact of the pandemic on TB mortality across Brazilian macroregions using Bayesian structural time series modeling.

Design/Methods: An Ecological time series study conducted using national mortality data from the Mortality Information System (SIM) from January 2012 to December 2022. TB deaths were analyzed at national and regional levels. A Bayesian Structural Time Series (BSTS) model, in combination with ARIMA models, was used to estimate counterfactual TB mortality rates for pandemic period (2020–2022), allowing inference of the causal impact of COVID-19 on TB mortality.

Results: There were 51,809 TB deaths recorded during 2012-2022 in Brazil. The model predicted a national TB mortality rate of 0.18 per 100,000 (95% CI: 0.18–0.19) during the pandemic period, while the observed mean rate was 0.20, indicating a cumulative excess mortality of 9.9% (95% CI: 8.8%–11%). Midwest region showed the greatest relative increase, with a 30% rise in TB mortality (95% CI: 25%–35%). The probability of a causal impact was high across all regions: Brazil (99.90%), Midwest (99.90%), Southeast (99.90%), South (99.90%), Northeast (96.77%), and North (99.58%), indicating a significant and widespread effect of the pandemic on TB mortality (Figure 1).

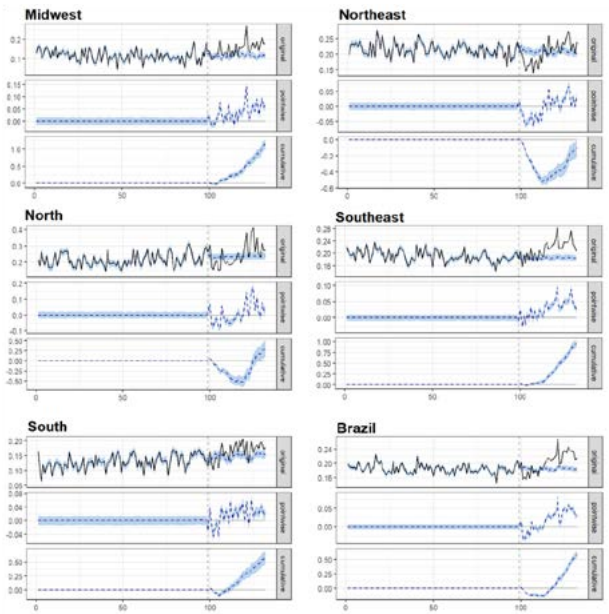

Figure 1. Causal effect analysis on tuberculosis mortality after COVID-19 pandemic period, by regions, Brazil, 2012–2022.

Conclusions: The findings reveal a substantial impact of the COVID-19 pandemic on TB mortality in Brazil, with regional variations highlighting differential vulnerabilities. The excess mortality observed underscores the need for strengthened TB surveillance and recovery strategies, especially in regions disproportionately affected. Bayesian time series models provide a robust framework for evaluating long-term consequences of public health crises on endemic diseases such as TB.

SOA15-673-21 A cross-sectional study to identify comorbidities contributing to deaths among people with TB using verbal autopsy tool in Tamil Nadu, India

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Background and challenges to implementation: In the year 2023, 10.8 million people diagnosed with TB and 1.25 million people died. India accounted about 29% of global TB deaths. Death rates increased by 2% following the covid pandemic in Tamil Nadu (TN). In alignment with the End TB objectives pertaining to mortality rates, TN has embarked upon a methodical and organized framework for analysing tuberculosis-related fatalities under the initiative "Tuberculosis Death Surveillance & Response" (TB-DSR).

To understand and plan interventions, Verbal Autopsy (VA) of deaths among registered People with TB (PwTB) were systematically conducted using standardized questionnaire.

Intervention or response: A cross-sectional study was conducted using VA data submitted from April 2023 to March 2024. VA consist of interviews with the close relatives of the deceased PwTB by trained National Tuberculosis Elimination Programme (NTEP) staff within 21 days of occurrence of death and ICD-10 classification assigned by Medical Officer (MO). Responses were analysed using Microsoft Excel by two independent researchers.

Results/Impact: 5,395 deaths were reported, out of which 5078 (94.1%) VA submissions were completed. The mean age of the deceased PwTB were 42±13 years, predominant gender male 2,720 (53.5%) and 3,171 (62.3%) occurrences of death in home. 4,375 (86.0%) PwTB were diagnosed with pulmonary TB. Valid International Classification of Diseases-10 (ICD-10) assigned for 3,458 deaths, wherein TB as underlying cause of death were assigned to 672 (19.4%), 231 (6.7%) were respiratory failure, 80 (2.3%) were cardiac complications, 60 (1.8%) related to kidney diseases, 35 (1.0%) HIV related complications, 31 (0.3%) had co-existing malnourishment and 13 (0.2%) related to diabetes.

Conclusions: Performing VA by trained health staff and assigning ICD-10 by MO has yielded information on the various comorbidities causing deaths in PwTB. Implementing TB-DSR helps the program managers in addressing comorbidities upfront at the time of initiation of TB treatment which is a key strategy in reducing mortality rates.

SOA15-674-21 Preventable TB deaths reported by coroners in England and Wales: A case series and guideline review

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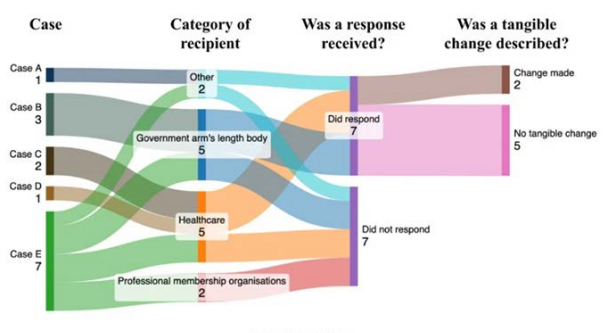
Background: Although the United Kingdom (UK) is a low-incidence tuberculosis country, the incidence is increasing and it has not met global End TB targets to reduce tuberculosis deaths. For preventative deaths, coroners in England and Wales have a duty to write Prevention of Future Deaths reports and send these to recipients who must respond within 56 days with action to prevent similar fatalities.
This study aimed to (1) describe preventable deaths from tuberculosis in England and Wales, (2) analyse recommendations from coroners and subsequent preventative actions, and (3) review how these recommendations align with existing TB guidelines.
Design/Methods: A database of 5036 coroners' reports was searched using the Preventable Deaths Tracker to identify deaths involving tuberculosis in England and Wales between 2013 and 2024. Descriptive statistics were used to synthesise the quantitative data and thematic analysis to identify themes in the concerns reported by coroners and organisational replies to coroners. UK guidelines on tuberculosis related to the coroners' concerns were reviewed.

Figure 6: A Sankey diagram describing the sending of, and responses to, Prevention of Future Death reports (PFDs) describing deaths involving tuberculosis in England and Wales between July 2013 and 19 May 2024.



Results: These were reports on five preventable tuberculosis deaths; median age at death was 28 years. Two of the deceased were nurses, impacted by occupational tuberculosis exposure. Coroners' concerns focussed on the occupational risks of tuberculosis to health workers, lack of awareness of tuberculosis symptoms and risks among health professionals in the UK leading to missed diagnoses, and insufficient guidelines for tuberculosis contact tracing and screening prior to initiative immunosuppressive treatment. Organisational responses to prevention of future death reports were inadequate, only two described tangible changes. (Figure 1) A review of guidelines found that health workers were not consistently identified as an at-risk population.
Conclusions: To achieve the WHO End TB strategy in the UK, greater attention should be given to screening and protection for health workers and raising awareness about the persistent burden of tuberculosis in the UK to avoid missed diagnoses.

SOA15-675-21 How does the family perceive TB deaths? Qualitative analysis of TB deaths in the RATIONS trial

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Background and challenges to implementation: With 1.25 million TB deaths in 2023, TB has returned as the world's leading cause of death. We aimed to understand how the family perceives TB death, the context, and family circumstances during TB death in the RATIONS trial.
Intervention or response: Nested within the RATIONS trial in Jharkhand, India, this is a secondary qualitative analysis of field-notes of the trial staff who visited 108 families bereaved due to TB death during the intervention period. The field staff visited the family after a TB death, talked to them, and noted the circumstances, symptoms, and their perceptions to identify strategies to reduce deaths during the trial. The field-notes were manually coded, grouped, and thematically analyzed. Direct quotes were employed to describe the themes.
Results/Impact: The results underscore the vital role of understanding how the family perceives TB death. The most striking symptoms for the family preceding death were severe breathlessness, weakness, hemoptysis, poor appetite, and medication side-effects. Hospitalization and lack of resources like finances, vehicles, and social support systems to accompany a patient to the hospital emerged as important hurdles. COVID-19-related lockdown worsened their ability to navigate.
A reluctance for hospitalization rooted in past unpleasant experiences was evident. Co-morbidities such as severe anemia, diabetes, hypertension, liver problems, jaundice,

and mental health issues were often aggravating factors. Alcohol emerged as an important concern, which the family felt worsened the situation. The belief in evil-eye was common, and a lot of resources were spent dealing with superstitions involving local healers.

Theme	Categories	Representative quote of the family
Disease severity	Hemoptysis, breathlessness, weakness, poor appetite	"had a big bout of blood in cough, huge clots, must have died because of that"
Hospitalization	Scared of the hospital, did not want admission, no one to accompany, no money	"he did not want to go to the hospital because he was scared of the doctor scolding him, hospital people would say swear words so did not want to go there"
Comorbidities	Anemia, diabetes, hypertension, liver failure, kidney disease, depression, alcohol, pregnancy	"there was swelling of abdomen, we took to hospital to remove the fluid, some pipe was also inserted to remove fluid from the lungs and abdomen"
Local beliefs	Evil eye, traditional healer, supernatural phenomenon	"because of evil eye, stopped speaking and one side of body did not move, we offered sacrifice also, but did not work"
Covid-19 pandemic	Scared of Covid-19, lockdown, vaccination	"could not breathe properly, probably had less oxygen, could not go to the hospital due to lockdown, no vehicle also"

Conclusions: Understanding family circumstances and local belief systems is important to improve TB-care. Bolstering an integrated, quality, and easier continuum of care that is respectful and patient-centered and covers prevailing communicable and non-communicable diseases, mental health issues, and injuries is essential. Hospitalization prior to TB death is resource-intensive and is a barrier to mortality reduction efforts.

SOA15-676-21 Navigating the road to recovery: User journeys and barriers among persons with drug-resistant TB in South Africa

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Background: In South Africa, better diagnostics and decentralized treatment have improved care for persons with drug-resistant tuberculosis (PWDR-TB). Despite this, up to 16% of PWDR-TB are lost to follow-up, leading to advanced illness and transmission risks. Understanding the user journey in DR-TB care uncovers behavioural insights to address treatment interruptions.
Design/Methods: We conducted two focus group discussions (FGDs) with adult PWDR-TB; one FGD and two in-depth interviews with healthcare providers (HCP) from August-September 2024 in Gauteng Province. We recruited participants from decentralised DR-TB treatment sites and a DR-TB hospital. We used semi-structured discussion guides informed by human-centred design principles. A behavioural science lens was applied to conduct a thematic analysis of engagement in DR-TB care.
Results: In the PWDR-TB FGDs (n= 15) the majority of participants were males, age range 23-70 years. The HCPs (n=10) were mostly nurses. After actively seeking medical help due to symptoms, PWDR-TB often faced multiple consultations and referrals across health facilities which delayed early treatment initiation. Limited knowledge of DR-TB, disbelief, denial, fear, and stigma impacted information processing and delayed treatment uptake along with cultural beliefs as causes of illness. Fear of disclosure, substance abuse, financial stressors and job loss fears were additional barriers to treatment initiation and adherence. PWDR-TB who reported challenges with treatment adherence, endured severe illness and hospitalization before learning the importance of adherence. Unreliable transport services made clinic attendance challenging necessitating alternate costly travel arrangements. Motivators to remain in TB care included strong relationships with nurses, improved DR-TB knowledge, family support, aspirations to live for children and achieve life goals.
Conclusions: Major challenges in user journeys were lack of knowledge of DR-TB and treatment requirements, adhering to cultural beliefs and stigma. Re-framing DR-TB information using behavioural insights to co-design messaging to be easy, accessible, simple and timely could improve understanding of DR-TB.

SOA15-677-21 Six districts with sustained TB death rate reduction following differentiated TB care in Southern India

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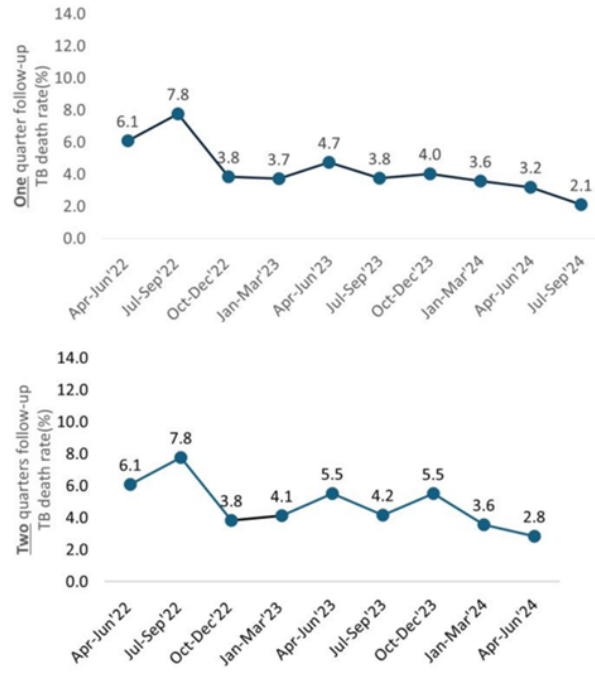
Background and challenges to implementation: Starting April 2022 (still ongoing), Tamil Nadu implemented the Tamil Nadu-*Kasanoi Erappila Thittam* (TN-KET), India's first state-wide (n=30 TB districts) differentiated TB care initiative aimed at reducing TB deaths. All adults (≥15 years) with drug-sensitive TB notified from public facilities are triaged at diagnosis. Those with very severe undernutrition or respiratory insufficiency or poor performance status (triage-positive) are prioritized for comprehensive assessment and inpatient care. The focus is on triaging at diagnosis as 70-80% of all TB deaths are early.
Intervention or response: Routine evaluation of the impact on TB death rate following TN-KET is done. For each 'quarterly-diagnosis' cohort, the aggregate number of notified people is the denominator. Among these, the districts track the aggregate number of deaths before the end of next quarter (one quarter follow up TB death rate) and before the end of next-to-next quarter (two quarters follow up TB death rate). Starting July 2022, the TB death rate for each quarterly-diagnosis cohort was compared to April-June 2022. Based on our estimates, 20-30% reduction is of significance to public health. As of July-September 2024 diagnosis cohort (n=9 quarters) for one quarter follow up TB death rate and April-June 2024 diagnosis cohort (n=8 quarters) for two quarters follow up TB death rate, districts with >50% quarters showing reduction were considered as excellent.
Results/Impact: Six districts have shown excellent performance: Cuddalore (9/17 quarters), Dharmapuri (15/17), Kanniyakumari (15/17), Karur (13/17), Salem (9/17) and Villupuram (10/17). In addition to reducing the losses in care cascade, the following are the reasons for excellent performance: quality triaging, quality comprehensive assessment, availability of isolation TB beds with therapeutic nutrition, and leadership by the district TB officers.

Figure. Trend of one quarter and two quarters follow up TB death rate, by quarterly-diagnosis cohorts, Karur district, Tamil Nadu, India (2022-2024)*



*Tamil Nadu *Kasanoi Erappila Thittam* (TN-KET), the differentiated TB care initiative to reduce TB deaths started in April 2022

Conclusions: TN-KET offers a scalable model for sustained TB death rate reduction. This effect needs to be confirmed through confounders adjusted individual level data analysis and is ongoing.

SOA16 Geospatial analytics and mapping for TB prevention, detection and care

SOA16-678-21 Leveraging artificial intelligence to predict potential TB hotspots at the community level in Bangui, Republic of Central Africa

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Background: The Central African Republic (CAR) remains one of the countries with the highest tuberculosis (TB) burdens globally. In the capital city, Bangui, TB risk is fueled by extreme poverty, limited healthcare access, high HIV prevalence, malnutrition, low immunization coverage, and overcrowded living conditions. These challenges contribute to substantial underdiagnosis and under-reporting of TB cases, limiting effective public health responses.

Design/Methods: We developed a digital epidemiological model to estimate undiagnosed TB and predict community-level hotspots across Bangui. Our approach integrated passive TB notification data, population and settlement mapping, clinic catchment areas based on travel time, and socio-environmental covariates. A Bayesian probabilistic model was applied over a 100 × 100 meter grid, enabling fine-resolution predictions of TB positivity. The city was stratified into three risk categories: low (≤5 TB positives/1000 tested), medium (5–10/1000), and high (>10/1000). Neighborhood-level TB diagnosis data were validated against clinic records to support risk classification.

Results: The model produced a detailed prediction map of TB positivity, covering both urban and remote settlements (Figure 1). Of the 12 facilities that provide treatment services, two, seven, and three were classified to be located in high-, medium-, and low-risk regions, respectively (Table 1). Predictive analysis revealed positive correlations between TB positivity and population density, night-time lights, and vaccination coverage. Negative correlations were found with variables such as underweight children and HIV incidence, suggesting disparities in access to care and limitations of passive case detection. (Table 2).

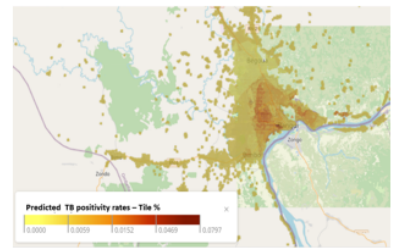

Figure 1. Predicted TB positivity rates in 100 × 100 meter areas in Bangui.

Table 1. Comparison of predicted and notified TB positivity in the vicinity of TB clinics.

TB Clinic	Predicted TB Positivity	Notified TB Positivity
Petevo Centre de Santé	Medium	Low
Lakounanga Urbain Centre de Santé	High	High
Centre de Santé Saint Joseph	Low	No data available
Complexe pédiatrique	Medium	No data available
CNRISTAR CTA	Low	No data available
Castors CSU	High	High
CNHUB HN	Medium	Low
Mamadou Mbaiki Centre de Santé	High	High
Hospital Communautaire	Low	High
Obrou Fidel Camp Centre de Santé	Medium	High
Amis Afrique ONG	Medium	Low
Malimaka	Medium	Medium
Hospital Amitiés	Medium	Medium
Bédé Combattant CSU	Medium	High

Table 2. Pearson correlation coefficients computed for predicted TB.

Variables	Pearson Correlation Coefficient	*p*-Value
Population density	0.67	<0.001
Observed TB positivity rate	0.61	<0.001
Night-time lights	0.47	<0.001
DPT 3 vaccination (%)	0.3	<0.001
DPT 1 vaccination (%)	0.3	<0.001
Children underweight (%)	−0.31	<0.001
HIV Incidence rate	−0.27	<0.001
Distance to built settlements	0.25	<0.001
Children stunted (%)	−0.23	<0.001
Measles vaccination (%)	0.21	<0.001
Access to improved water source (%)	0.205	<0.001
Lacking sanitation services (%)	0.18	<0.001
Distance to major roads	−0.13	<0.001
Elevation	−0.10	<0.001
Literacy among males (%)	0.09	<0.001
Literacy among females (%)	0.05	<0.001
Child mortality rate	0.03	<0.001

Conclusions: This study highlights the value of AI-powered, high-resolution modeling for TB surveillance in resource-limited settings. The approach supports the identification of underserved areas, improved resource targeting, and more strategic public health planning.
Future integration of multidrug-resistant TB and active case-finding data may further enhance its impact and scalability.

SOA16-679-21 Spatial analysis of TB disease and infection: Identifying priority areas for active contact management in Brazil

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Background: In Brazil, coverage of tuberculosis preventive treatment (TPT) among contacts of people with tuberculosis (TB) is heterogeneous. Identifying areas with high TB incidence and low TPT notification can help guide more effective interventions. This study aimed to identify priority areas with a high TB incidence rate and low programmatic response in contact tracing, measured by TPT notification.
Design/Methods: This was an ecological study using aggregated data at the municipal level from the Notifiable Diseases Information System (Sinan) and the Latent Tuberculosis Infection (IL-TB) database for the year 2023. TB incidence rates were estimated, and spatial scan statistics were applied to identify high-risk clusters. The relative risk (RR) was calculated by comparing the likelihood inside versus outside scanning window. Clusters were then correlated with IL-TB data. All spatial scan and relative risk analyses were performed using SaTScan (version 10.3). Thematic maps were created using QGIS (version 3.40.3).

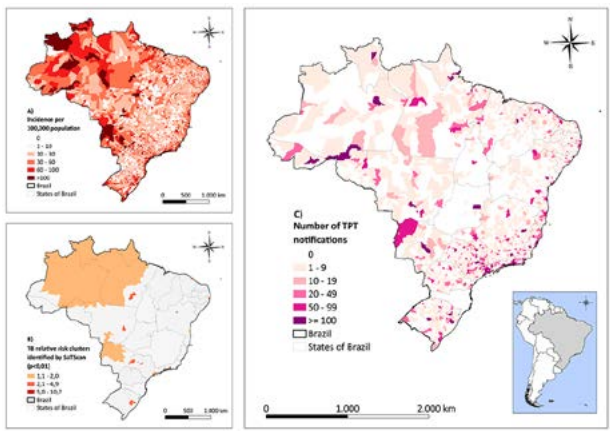

Figure 1. Spatial distribution of tuberculosis incidence, relative risk clusters, and tuberculosis preventive treatment notifications in Brazil, 2023.

Results: A spatial mismatch was observed between the distribution of TB and the programmatic response to TB infection. A significant proportion of municipalities in the North and Central-West regions showed TB incidence rates higher than 100 cases per 100,000 population, while 90% and 96% of these municipalities, respectively, reported fewer than 10 notifications of TPT.
Nationally, 22.3% of municipalities with TB incidence rates above the national average (39.7/100,000) reported fewer than 10 TPT notifications. The highest RR (ranging from 2.0 to 10.7) were found in the metropolitan areas of some state capitals as well as in rural areas.
Conclusions: Our spatial approach sucessfully identified operational gaps in contact management. These gaps concentrate in socially vulnerable territories, and may undermine Brazil's progress toward TB elimination. Prioritizing these areas for active interventions can strengthen equity and impact.

SOA16-680-21 Spatiotemporal dynamics and hotspot identification of TB in Eswatini: A national analysis from 2017 to 2024

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Background: Tuberculosis (TB) remains a significant public health challenge globally. In Eswatini, high TB incidence and prevalence are driven by factors such as TB/HIV co-infection, socioeconomic disparities across geographical areas, and unequal access to healthcare services.
Design/Methods: We analyzed national drug-sensitive TB data from 2017 to 2024, alongside annual population projections. Descriptive statistics, choropleth maps, and joinpoint regression were used to assess temporal trends across Eswatini's four regions and 55 constituencies. Spatial autocorrelation was evaluated using both Global and Local Moran's I statistics. Additionally, bivariate TB risk transitions between 2017 and 2024 were assessed.
Results: The analysis revealed significant spatiotemporal variation in TB prevalence, with distinct clusters (hotspots) observed across the country. Global Moran's I confirmed significant spatial autocorrelation, while Local Moran's I identified persistent hotspots in the lower Hhohho and upper Manzini regions.
Cold spots were found in upper Hhohho and border constituencies near Lubombo, as well as the southern parts of Manzini. Joinpoint regression indicated a significantly increasing TB trend in Manzini (APC = 10.99) and decreasing trends in Lubombo (APC = -4.27) and Shiselweni (APC = -7.94). Hhohho showed an overall downward trend, though not statistically significant. The bivariate

TB risk analysis showed that most constituencies maintained similar risk levels between 2017 and 2024. However, 6 constituencies transitioned from lower to higher risk, while 8 moved from higher to lower risk.
Conclusions: TB patterns in Eswatini are shaped by spatial and temporal dynamics, with neighboring areas often sharing similar risk profiles due to common environmental and social determinants. Identifying high-burden hotspots enables targeted interventions and more efficient allocation of resources.
Spatiotemporal analysis, along with emerging tools such as machine learning and wastewater-based surveillance, presents new opportunities to improve TB detection, forecasting, and response—ultimately supporting more precise and proactive control strategies.

SOA16-681-21 Exploring added value of novel data sources for small area prediction of TB burden in Pakistan: Private sector sales, telecom mobility and satellite imagery data

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Background: Recently, TB modelers have placed much attention on Pakistan, where burden remains high (5th globally), yet treatment gaps remain (66% treatment coverage). A persisting question is where specifically to focus case-finding efforts to maximize case detection amongst populations who otherwise may not access timely care. As health resources dwindle globally, the importance of efficient geographical targeting increases.
Design/Methods: Our primary research objective was to predict ACF TB positivity rates per 10,000 population in Pakistan using a range of predictors. In addition to TB notification and survey data, we included novel data sources: a health access index derived from telecom mobility data; aggregated rifampicin sales data among private sector vendors collected by IQVIA Pakistan Pharmaceutical Index (2021-2022); and a socioeconomic indicator derived from high-resolution satellite imagery. We fitted a spatially explicit Bayesian zero-inflated Poisson model to model B+ TB positivity rates from ACF events conducted in all Pakistan provinces, and compared performance of models with different sets of indicators.
Results: Fitting a Bayesian approximation of the zero-inflated Poisson model resulted in overall good model fit. Highest predictive power was attained from the full model containing spatial lag, socioeconomic variables, TB notifications and rifampicin utilization (k-fold validation R-sq=84%). Rifampicin utilization and TB notifications share similar predictive accuracy (k-fold validation R-sq=54-55%). A spatially explicit null model had much higher predictive accuracy and was able to explain small scale geographical variation unaccounted for by other models.
Conclusions: In the absence of TB data, socioeconomic predictors are powerful to support initial prioritization of TB case finding and outperform TB notifications and rifampicin utilization. However, highest predictive power is found in spatially explicit models accounting for locally observed TB yield. Geographically targeting higher-risk localities can be based on methodologies of varying levels of complexity, and even simple approaches can contribute to rational and evidence-based decision making for TB control.

SOA16-682-21 Mapping BCG vaccination coverage in Africa, 1990-2022: A novel spatiotemporal modelling study

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Background: Bacillus Calmette–Guérin (BCG) is the only licensed vaccine for tuberculosis (TB), providing protection against severe forms of the disease in children. Accurate coverage estimates at national and subnational levels are crucial for assessing progress toward TB control and identifying underserved populations across Africa. This study aimed to map BCG vaccination coverage in Africa from 1990 to 2022.
Design/Methods: This analysis included 111 demographic and health surveys, and multiple indicator household surveys conducted from 1990 to 2022, comprising data on 181,765 children from 36 African countries. A Bayesian geostatistical model was used to estimate BCG vaccination coverage and the number of unvaccinated children aged 12-23 months at a 5 × 5 km spatial resolution.
These estimates were aggregated to produce coverage data at the first administrative and national level for the period 1990 to 2022 for 36 countries.
Results: Between 1990 and 2022, BCG vaccination coverage increased in 81.90% (95% uncertainty interval [UI]: 78.41–85.07) of first-level administrative areas across 36 African countries. Despite this progress, significant geo-

graphical disparities persist both within and between countries. In 2022, many first-level administrative units still reported low BCG coverage and high number of unvaccinated children, even in countries with high national coverage rates. Some administrative units had consistently experienced low BCG coverage, remaining below 25% in both 1990 and 2022.
While notable progress was observed in several countries, only Lesotho and Burundi are likely to have met the Global Vaccine Action Plan target of achieving at least 80% coverage in all first-level administrative areas.
Conclusions: Despite significant progress in BCG vaccination coverage across Africa over the past three decades, notable geographic disparities persist, with many subnational areas falling below target coverage levels.
The current findings provide insights for targeted interventions to improve BCG coverage and enhance health outcomes, especially in underserved and unreached areas.

SOA16-683-21 Mapping TB preventive therapy in Ethiopia: Geospatial analysis

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Background: Although tuberculosis (TB) is a preventable disease, it remains a leading cause of morbidity and mortality worldwide. TB preventive therapy (TPT) is a critical intervention to prevent the progression from infection to disease, particularly in high-risk populations.
However, coverage and completion rates of TPT at subnational and local levels are yet to be investigated in Ethiopia. Therefore, this study aimed to estimate TPT coverage and completion rates at local and district levels across Ethiopia.
Design/Methods: TB notification data reported from July 2022 to June 2023 was utilized for this study. Covariates were accessed from publicly available data warehouses. A total of 1132 and 838 location data points were used for modelling TPT coverage and completion rate, respectively. Bayesian geostatistical model was used to estimate TPT coverage and completion rate across Ethiopia at 5x5 km spatial resolution, and these results were aggregated to produce district-level estimates.
Results: A total of 208,508 individuals were screened for TB during the study period and 169,890 were found to be negative for TB. Of these 53,498 individuals were initiated TPT.
Among a total of 39,760 individuals who started TPT in the previous year, 34,580 completed the treatment. The district-level TPT coverage ranged from 0.01% to 99%, indicating marked variation across districts in Ethiopia. Access to health facilities had negative association with both TPT coverage (β = -0.055; 95% CrI: -0.101-0.008) and TPT completion (β = -0.571; 95% CrI: -0.726-0.416). Population density was negatively associated with TPT completion rate (β = -0.344; 95% CrI: -0.584-0.104). In contrast, HIV/AIDS prevalence showed a positive association with TPT coverage (β = 0.241; 95% CrI: 0.183-0.298).
Conclusions: Our findings revealed marked variation in TPT coverage and completion rate at local and district levels. This suggests that certain areas, particularly those with low coverage and completion rates, require targeted strategies to improve TPT provision.

SOA16-684-21 Geospatial patterns of loss to follow-up from TB treatment: A gender-based analysis in Brazil

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Background: Brazil has made significant progress in TB detection, with a rate over 70%, but faces challenges in treatment completion. In 2023, 73% completed treatment, increasing the risk of tuberculosis (TB) resistance. Most studies focus on factors related to loss to follow-up (LTFU), neglecting geographic areas and gender disparities.
This study aimed to analyze the spatial distribution and gender differences in LTFU across Brazil.
Design/Methods: This ecological study analyzed TB cases classified as LTFU in Brazil between 2019 and 2022, using data from the Department of Informatics of the Unified Health System (DATASUS). Sociodemographic and clinical characteristics were analyzed with R software (version 3.6.3), and LTFU rates were calculated.
Geospatial analysis identified LTFU clusters, correlating patterns with gender and other factors. Choropleth maps by gender were created using ArcGIS software (10.8).
Results: A total of 91,883 people with TB, or14.7%, were LTFU. Women with HIV had a higher LTFU rate (19.43%) than men (13.21%).
Pulmonary TB accounted for 89% of LTFU cases. High LTFU percentages were seen in the Northeast, North, and Central-West, particularly in Goiás near the Federal District.
Conclusions: The study reveals higher loss to follow-up rates in men, but when considering gender and HIV co-infection, interruptions are more common in women.

Regional variations in LTFU were observed. The findings emphasize gender differences in treatment outcomes and the need for tailored interventions and integrated approaches between TB and HIV.

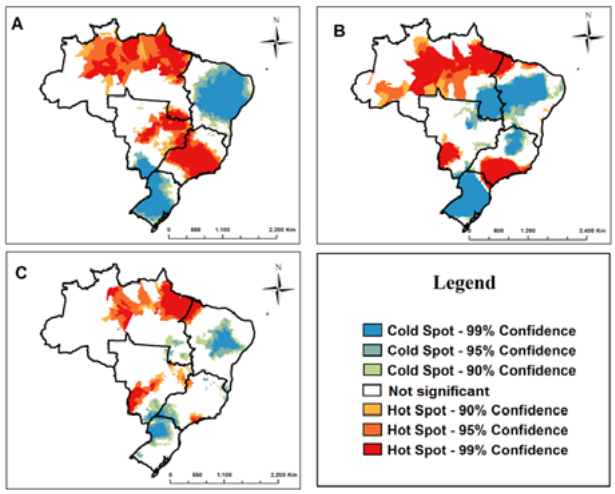

Figure 1 - Clusters of high and low values of tuberculosis lost to follow up rates according to gender and in the general population, Brazil, 2019-2022.
A - Clusters of high and low tuberculosis LTFU rates in the general population; B - Clusters of high and low tuberculosis LTFU rates in males; C - Clusters of high and low tuberculosis LTFU rates in females.

SOA16-685-21 Geospatial intelligence using QGIS tool for localised TB elimination: A multi-sectoral approach in Kasargod district, Kerala, India

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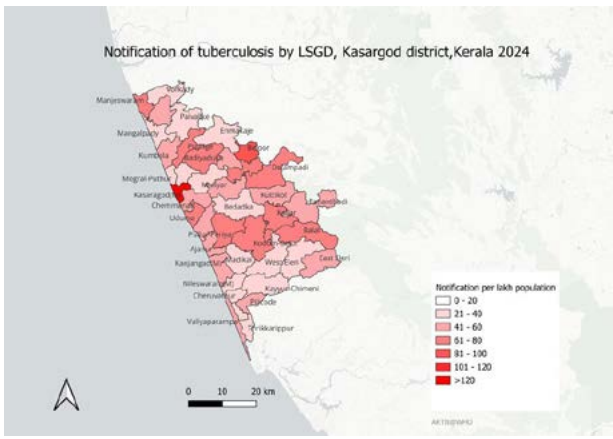
Background: Achieving „TB Mukth Panchayath" (TB-Free Local Self-Government Division - LSGD) status requires a granular understanding of tuberculosis (TB) epidemiology and the implementation of targeted, multi-sectoral interventions aligned with Sustainable Development Goals (SDGs).
This study employed geospatial analysis using QGIS, based on Nikshay surveillance data from 2022–2024 in Kasargod district, Kerala, India, to inform and localize TB elimination strategies.
Design/Methods: Routinely collected programmatic data were analysed at the LSGD level, including TB notification rates, Presumptive TB Examination Rates (PTER), and TB-specific mortality, mapped against population estimates and SDG-aligned thresholds (TB incidence <44/lakh, TB deaths <2/lakh). QGIS was utilized to visualize spatial heterogeneity and stratify Panchayaths by TB burden.
These insights guided the development of a multi-sectoral accountability framework involving representatives from LSGD, tribal welfare, coastal, fisheries, and labour departments.
This structure enabled integrated action planning, monitoring, and periodic district-level task force reviews.
Community engagement was fostered through "Kolayakkoottam" health debates, enhancing participatory governance.
Additionally, targeted media sensitization and capacity-building workshops were conducted to promote responsible TB-related reporting and public awareness.

Results: The application of QGIS enabled effective communication of TB burden and elimination roadmaps to LSGD members and diverse stakeholders. This facilitated collaborative planning and execution of interventions. Consequently, 10 Panchayaths in Kasargod district achieved TB Mukth Panchayath status by the end of 2024, demonstrating the effectiveness of this geospatial intelligence-driven, multi-sectoral approach.



Conclusions: Geospatial mapping of routine surveillance data, coupled with a robust multi-sectoral accountability framework, provides a powerful strategy for localized TB elimination. The experience in Kasargod highlights the potential of utilizing tools like QGIS to empower local administrations to plan and achieve significant progress towards national TB elimination goals.

SOA16-686-21 Emerging hotspots of TB in Uganda: Insights from spatiotemporal analysis

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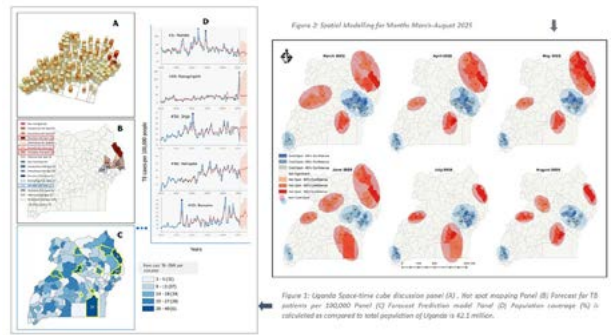
Background: Understanding TB incidence's is critical to optimizing control strategies and reducing transmission, we conducted spatial modeling using routine data to assess TB incidence, identified emerging hotspots, and forecasting trends in Uganda for effective disease control.

Design/Methods: We used space-time cube framework to analyze TB notification rates(CNR) surveillance data from the DHIS2. To understand spatial clustering of TB, Getis-Ord Gi* algorithm, was used to ascertain existence of hotspots intensity of clustering in high or low values and using a local z-score and P-values for each bin and space time cube. Mann-Kendall statistic was used to assess time series of z-scores and binning category for each bin, P-values <0.05 indicated statistical significance. Forest based-regression was used to forecast CNR for March-August 2025. Both forecast and validation root mean square errors were computed to evaluate performance of the March 2025 forecast. ARC-Gis was used for analysis, administration boundaries obtained from Uganda Bureau of Statistics.

Results: From 2020 to 2024, 276, 414 TB patients were identified, resulting in an CNR of 71.9 in 2020 to 158 per 100,000, 2024. Space time cube visualized in 3D highlighted colors darker in north east region meaning elevated CNR values (Panel **A**), from this incidence rates revealed statistically significant ($p \leq 0.001$) Hotspots for 5 districts Moroto (Persistent) and Nabilatuk, Amudat, Nakapiripipiti(Sporadic) and Kween (Oscillating)(Panel **B**), same districts have the highest forecasted TB rates as visualized in Panel (**C&D), n**otably only Soroti was replaced by Buvuma district with(53/100,000, 95%CI: 50–57), the model's RMSE for March 2025 was 11.2/100,000 supporting a high predictive accuracy. Forecasts for hotspots were made beyond March as visualized in Figure **2.**



Conclusions: The hotspots have highlighted areas where the results of epidemiological evidence can start to manifest in data, future iterations of this model could be integrated into the national TB surveillance framework for near-real-time hotspot monitoring and resource allocation.

SOA17 Innovations and insights in tobacco control: From community action to policy reform

SOA17-687-21 Who speaks for the margins? Indigenous communities, tobacco, and policy representation in India: A qualitative analysis of parliamentary questions from India (1952-2022)

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Background and challenges to implementation: Tobacco use is a major public health challenge that is higher among the Indigenous communities in India. In the last few decades there have been a decline in tobacco consumption; however, the social disparities in tobacco use have widen among the indigenous communities. Tobacco policies in India lacks addressing the issues experienced by the Indigenous communities.
This study aims to explore how concerns related to Indigenous communities and tobacco are presented at the national level and explores to draw inferences on the existing disparities in tobacco use among the indigenous communities compared to other communities.
Intervention or response: The study uses digital transcripts of question hours from lower-and-upper houses of the Indian parliament that spans over a period of 70 years (between 1952-2022). The question hours are platform where parliamentarians ask questions and ministers answers them. Different concerns are raised during these sessions; and out of 2556 transcripts on indigenous communities and tobacco, 301 transcripts that were thematically categorized and analyzed for the study.
Results/Impact: While tobacco use among the indigenous communities still remains high, leading to higher disease burden and mortality; it fails to get attention at the national platform. Concerns presenting indigenous communities as workers and contributors in the tobacco industry gets more limelight rather than the impact of the industry on the community. The politics of representation plays a significant role in brining the margins to the core of healthcare policies.
Conclusions: Public health research and advocacy efforts need to acknowledge the complex and multiple intertwining links between tobacco (industry) and indigenous communities. There is a need to sensitize policymakers on the health and environmental impacts of tobacco. It is important to break the chains of selective attention for more inclusive and justice driven policies.

SOA17-688-21 A challenging intervention success: Tobacco use reduction in hard-to-reach communities in Sri Lanka

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Background and challenges to implementation: Tobacco use remains a critical public health issue in Sri Lanka, particularly within hard-to-reach communities such as fishers, daily wage earners, and transport workers. Despite a national tobacco use rate of 19.4% (Global Adult Tobacco Survey, 2020), specific subpopulations experience disproportionately high usage due to occupational conditions, limited awareness, social norms, and industry targeting.
Intervention or response: From July to November 2023, the Alcohol and Drug Information Centre (ADIC) implemented a tobacco use reduction project across 10 hard-to-reach communities, directly engaging 270 individuals. Ten Field Level Implementers (FLIs) from within the communities were trained to lead the initiative, ensuring cultural sensitivity and long-term sustainability.
Activities included awareness sessions, informal discussions, and community-led tools such as income-expenditure books and savings tills, designed to visualize the financial burden of tobacco use and encourage behavior change.
Additionally, interactive methods like storytelling, role-plays, and peer sharing were used to foster trust, stimulate dialogue, and enhance personal reflection on tobacco-related harms. This bottom-up approach promoted ownership and deeper community involvement in the intervention process.
Results/Impact: The intervention achieved notable success. A total of 77 individuals (28.5%) reduced their tobacco use, while 33 individuals (12.2%) quit entirely. Additionally, 78 individuals (28.9%) began saving money previously spent on tobacco.
Positive ripple effects included increased time spent with family, better nutrition for children, enhanced economic awareness, and improved well-being. Communities reported strengthened unity, improved knowledge of industry manipulation strategies, and heightened motivation to sustain healthier lifestyles.
Conclusions: Reducing tobacco use in marginalized communities is challenging but possible through tailored, informal, and economically framed interventions. Approaching the issue via financial and social consequences—rather than purely health-based messaging—proved more effective in engaging these groups. Continuous, community-driven follow-up is essential for long-term change and sustainability.

SOA17-689-21 Effects of new pictorial cigarette pack warnings on Vietnamese smokers' perceptions and smoking behaviours: A single-factor, between-subjects experimental study

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Background: This study aimed to assess the effects of different cigarette package pictorial health warnings (PHW) configurations that Vietnam might consider in the future.
Design/Methods: A randomized experiment was conducted with 1,010 adult smokers in Vietnam in 2024. Participants were assigned to one of five groups:
1. Branded pack with new PHWs covering 50% (n=200),
2. Branded pack with new PHWs covering 85% (n=202),
3. Branded pack with new PHWs + Quitline, covering 85% (n=204), and (4) plain pack with a new PHWs + Quitline, covering 85% (n=203), and (5) control group with branded packs featuring the current PHWs, covering 50% (n=201).
We measured four sets of outcomes:
1. Emotional and cognitive responses,
2. Attitudes and beliefs about smoking-related harms, and;
3. Behavioral intentions measured immediately after viewing PHWs, and;
4. Recall and behavioral outcomes at two-week follow-up.
Results: Group 2 (new PHWs, covering 85%) had significantly higher negative emotional responses than group 4 (new PHWs+Quitline+Plain packaging, covering 85%).
For smoking causes oral cancer and smoking causes bleeding in the brain and stroke, the mean belief scores of group 2 (new PHWs, covering 85%) were significantly higher than those of the control group.
At two-week follow-up, participants in group 3 (new PHWs+Quitline, covering 85%) and group 4 (new PHWs+Quitline+plain packaging, covering 85%) were more likely to recall the quitline number compared to the control group.
Additionally, participants in group 4 (new PHWs + Quitline + plain packaging, covering 85%) had higher odds of forgoing a cigarette at two-week follow-up compared to the control group.
No significant impact of group on quit intention or cessation behaviors was observed.
Conclusions: Our study supports refreshing PHWs, showing that new PHWs with quitline information enhanced awareness of quitline services. Plain packaging with new PHWs increased the likelihood of forgoing cigarettes, a precursor to cessation attempts.

SOA17-690-21 Leveraging online media for the Tobacco Free Youth Campaign increased the visibility of tobacco control efforts among youth in India

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Background: Online media is a cost-effective means to promote a social cause, and it can be leveraged to increase the participation of youths. The Indian Health Ministry launched a 60-day Tobacco-Free-Youth-Campaign to empower youth against tobacco use.
The campaign focused on awareness raising, promotion of Tobacco Free Educational Institutions and Tobacco free villages, strengthening the tobacco control acts and enforcement, and social media engagement. Leveraging online media for youth-related campaign promotion significantly increases the outcome.
Design/Methods: The study used a qualitative content analysis approach. Search term "Tobacco Free Youth Campaign 2.0 and #TobaccoFreeYouthCampaign was used in Google search, and the first 50 links were analysed based on utilization of various social media platforms, media coverage, civil society and state government news uploads, and social media influencers' accounts.
Results: The Health Ministry used X, Facebook, Instagram, and YouTube accounts to publicize the event, The Education Ministry has also uploaded details on X. The Campaign was inaugurated (virtually) on YouTube. The Press Information Bureau uploaded the news. Social media influencers shared the campaign on their accounts. Local and major online news portals covered the campaign. Several episodes on youth and tobacco control are made available on YouTube. Campaign visible on the government's MY-Bharat website targeting youth. The online No Tobacco Pledge platform is made available. #TobaccoFreeYouthCampaign #SayNoToTobacco tags used.
Celebrities are involved in the digital awareness campaign. As per the campaign data posted by the Ministry, the influencers' posts regarding the campaign received over 40 million views.
Background and challenges to implementation: Online media is a cost effective means to promote a social cause and it can be leveraged to increase the participation of audience especially youths. Indian Health Ministry launched a 60 Day Tobacco Free Youth Campaign to empower youth against tobacco use. The campaign focused on awareness raising, promotion of tobacco free educational institutions and tobacco free villages, strengthening the tobacco control acts and enforcement and social media engagement. In todays scenario in order to involve youth, visibility on internet medium plays an important as internet is becoming a battle ground for pro tobacco and anti tobacco advocates.
Conclusions: In today's scenario, traditional media are not very effective, and the internet should be leveraged to reach out to youths. There should be more youth-focused

campaigns on social media with the involvement of social media influencers, as youth are spending a lot of time on social media.

SOA17-691-21 Decoding public perception: Knowledge, attitudes, and practices on WHO FCTC Articles 9 and 10 in India

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Background: Tobacco use kills over 8 million people each year, and India is one of the most affected as a top producer and consumer. Despite robust tobacco control policies, gaps persist, challenging effective implementation. The WHO FCTC Articles 9 and 10 emphasize the regulation of tobacco product contents, emissions, and disclosures to strengthen global tobacco control efforts. Limited research exists on the Indian population's knowledge, attitudes, and practices (KAP) regarding these provisions. This study assesses KAP to provide insights for improving awareness and compliance with these regulations.
Design/Methods: A cross-sectional study was conducted in September 2024 among individuals aged 18 years and above across India. Data were collected using a structured, pre-tested online questionnaire, distributed via Google Forms. The questionnaire assessed participants' demographic characteristics, knowledge, attitudes, and practices related to the regulation of tobacco product contents and disclosures. Descriptive statistics were used to summarize the data, while associations between variables were analyzed using chi-square tests and logistic regression.
Results: The study included 106 participants, mostly aged 21–40 years (68.9%), with an equal gender split (53.8% male, 46.2% female) and 66% holding postgraduate qualifications. Awareness of WHO FCTC Articles 9 and 10 was reported by 54.7% and 56.6%, respectively. Gender showed no significant association with knowledge ($p = 0.808$) or attitudes ($p = 0.148$), though females had slightly more positive attitudes (91.8%). Age significantly influenced knowledge ($p = 0.049$) and attitudes ($p = 0.005$), with younger participants (21–40 years) showing better attitudes (89%) but moderate knowledge (63% poor). Tobacco control experience strongly impacted knowledge ($p = 0.003$), with active professionals demonstrating higher levels.
Conclusions: The findings reveal strong support for tobacco regulation, transparency, and international collaboration, alongside gaps in knowledge, particularly among younger individuals. Targeted education and robust implementation of WHO FCTC Articles 9 and 10 are crucial for addressing these challenges.

SOA17-693-21 Data-driven regulation: Prioritising hazardous constituents in smokeless tobacco in India

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Background: Smokeless tobacco (SLT) use is highly prevalent in India, posing a significant public health threat. This study aimed to develop a framework for prioritizing hazardous SLT constituents based on toxicity, attractiveness, and addictiveness to inform regulatory policies
Design/Methods: A comprehensive database of SLT constituents was compiled through a literature review (2005-2024) adhering to PRISMA guidelines, encompassing PubMed, Scopus, and Web of Science databases. The review integrated recommendations from the WHO Study Group on Tobacco Product Regulation, IARC monographs, and the US FDA's list of harmful and potentially harmful constituents.
A multidisciplinary expert panel (n=24) evaluated 120 identified constituents using a structured digital evaluation form and a 10-point Likert scale. Constituent prioritization was conducted using the Analytic Hierarchy Process, equally weighting toxicity, addictiveness, and attractiveness criteria.
Results: The analysis identified over 120 hazardous SLT constituents, including 65 classified as carcinogenic by the IARC (5 Group 1, 10 Group 2A, and 24 Group 2B). Nicotine emerged as the highest priority constituent (priority vector = 0.218), followed by tobacco-specific nitrosamines NNN (0.187) and NNK (0.167), and heavy metals lead (0.165), cadmium (0.162), and arsenic (0.158). Strong inter-rater agreement was observed across all criteria (Kendall's $W = 0.83$, $p < 0.001$), with a particularly high consensus for toxicity assessments ($W = 0.88$).
Background and challenges to implementation: Smokeless tobacco (SLT) use is highly prevalent in India, posing a significant public health threat. This study aimed to develop a framework for prioritizing hazardous SLT constituents based on toxicity, attractiveness, and addictiveness to inform regulatory policies.
Intervention or response: A comprehensive database of SLT constituents was compiled through a literature review (2005-2024) adhering to PRISMA guidelines, encompassing PubMed, Scopus, and Web of Science databases. The review integrated recommendations from the WHO Study Group on Tobacco Product Regulation, IARC monographs, and the US FDA's list of harmful and potentially harmful constituents.
A multidisciplinary expert panel (n=24) evaluated 120 identified constituents using a structured digital evaluation form and a 10-point Likert scale.
Constituent prioritization was conducted using the Analytic Hierarchy Process, equally weighting toxicity, addictiveness, and attractiveness criteria.

Conclusions: This evidence-based prioritization framework provides a crucial tool for advancing SLT regulation in India by identifying key constituents requiring monitoring and control. Policy recommendations include mandatory disclosure of priority chemicals on product packaging, establishing maximum permissible limits for priority toxicants, developing a network of accredited testing laboratories, and implementing standardized testing protocols aligned with WHO FCTC Articles 9 and 10. These measures aim to mitigate SLT-related morbidity and mortality through enhanced tobacco product regulation

SOA17-694-21 Restoring FCTC shadow reporting with the Global Tobacco Control Progress Hub

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Background and challenges to implementation: Civil society engagement is a cornerstone of the WHO Framework Convention on Tobacco Control (FCTC), as described in Article 4 of the treaty. Key to this engagement is the preparation and submission of FCTC "shadow reports" by civil society organizations (CSOs). Shadow reports provide an independent analysis of FCTC implementation and adherence to supplement national self-reports from participating countries.
Intervention or response: The Global Tobacco Control Progress Hub (www.globalprogresshub.com) was created in 2023 by ASH Canada and the Institute for Global Tobacco Control at Johns Hopkins Bloomberg School of Public Health. The purpose of this robust open-access data analytics platform is to allow all tobacco control stakeholders to participate in FCTC monitoring, surveillance and reporting. The platform contains five dashboards that portray visualized treaty implementation data representing over 180 countries and over 300 performance indicators spanning 14 years of reporting. One of the core functions of the platform is to support the creation of FCTC shadow reports using the datasets and visuals to report on national treaty implementation. CSOs can prepare national FCTC shadow reports with a user-friendly template developed by ASH Canada.
Results/Impact: Over 35 CSOs from as many countries have produced national FCTC shadow reports using the platform since 2023. Most of these CSOs are from low- and middle-income countries. The total population represented by these reports is 2.7 billion people, or one-third of the global population. ASH Canada recently used the platform to produce a shadow report on SDG Target 3.a (Global FCTC implementation). We will present results and findings from the shadow reporting effort and its potential impact on FCTC implementation.
Conclusions: The Global Tobacco Control Progress Hub has helped restore FCTC shadow reporting by civil society organizations. Independent surveillance and reporting can help improve treaty implementation and government accountability regarding FCTC adherence and execution.

SOA17-695-21 Innovative financing for sustaining tobacco control in low resource settings in the state of Himachal Pradesh, India

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Background and challenges to implementation: Himachal Pradesh, a north Indian State with a population of about 7 million, has made substantial progress tobacco control in last 15 years. Tobacco use has decreased from 22% to 11.6%, and second hand smoke exposure in homes has dropped from 82.5% to 19.5% between 2010 and 2024 (GATS & State Surveillance System).
Notably, the state has achieved the lowest tobacco use (1.1%) among youth aged 13-15 across all Indian states as per GYTS-4. With the ambitious goal of reducing adult tobacco use to below 10% by 2025 and below 5% by 2030, Himachal Pradesh is working toward achieving Tobacco Endgame.
This study highlights the innovative financing mechanisms to sustain Tobacco Control in Himachal Pradesh since 2010.
Intervention or response: Tobacco control began as a collaborative effort between the Government and NGOs in 2007-08 in the State. The State, District, and Sub-District teams were designated for enforcement and monitoring of tobacco control policies.
The key innovation remained to use the funds collected as fine (for violating tobacco control law) for financing tobacco control initiatives.
Other significant measures include the ban on Electronic Cigarette, adherence to Article 5.3 of FCTC, Tobacco Vendor Licensing Act of 2016, strengthening tobacco cessation centres, Tobacco-free educational institutions and Panchayats (village cluster) scheme.
Results/Impact: The funds collected from tobacco-related violations, approximately 1 Crore INR (115,000 USD) annually are used for awareness, capacity building, and enforcement activities to strengthen tobacco control in the state (*Figure 1*).
Himachal Pradesh achieved "Smoke-free State" status in July 2013 and adult tobacco use has reduced by > 40% in last 15 years.
Conclusions: Innovative financing for tobacco control is essential for sustaining tobacco control particularly in resource-limited settings. This model provides a pos-

sible solution for the ongoing fight against tobacco use. Himachal Pradesh's experience can be replicated in other similar settings.

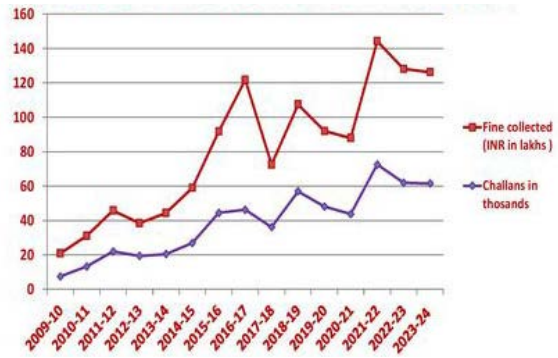

Figure 1. Number of persons fined (challans) for tobacco related volations and funds (INR collected as fine in the State of Himachal Pradesh from 2009 to 2024.

E-POSTER SESSION (EP)

EP46 Asymptomatic TB - reports from the field

EP46-1137-21 Asymptomatic TB: A new challenge

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Background: Asymptomatic tuberculosis (aTB) is a recent definition introduced by the World Health Organization, indicating a person with TB disease who did not report symptoms suggestive of TB during screening. One important implication of people with aTB is that they do not seek healthcare as they do not feel sick. Unless active case finding with tools other than symptoms screening is used, diagnosis of such individuals would be missed and this may fuel the TB epidemic as subjects with aTB can contribute substantively to TB transmission, even if they have no cough. We describe the features of bacteriologically confirmed aTB cases diagnosed in a referral centre in Italy.
Design/Methods: Monocentric, retrospective, observational study at Infectious Diseases Unit, IRCCS Azienda Ospedaliero-Universitaria of Bologna, Italy. Inclusion criteria: age ≥15 years old, bacteriologically confirmed TB (positive Xpert MTB/RIF and/or culture), no TB suggestive symptoms reported at the time of screening. Study period: January 2013-December 2024.
Results: We identified 82 individuals with bacteriologically confirmed asymptomatic TB in the study period. Thirty-two (39.1%) individuals were identified during diagnostic workup or follow up due to other reasons (i.e. trauma, cancers) while 50 (60.9%) subjects were detected during screening in high-risk groups (i.e. close contacts, migrants, health workers, candidates to biologics). All subjects underwent chest HRCT, revealing cavities in 30.5.% cases.
All cases were bacteriologically confirmed (61 Rif-S and 2 Rif-R). Out of 63 pulmonary TB cases, 13 (20.6%) had positive smear microscopy, indicating high bacillary load and contagiousness despite lack of symptoms. All individuals started anti-TB treatment, with a treatment success rate of 76.8%.
Conclusions: TB disease can present with advanced radiological findings and high bacillary load also in individuals not reporting symptoms. It is crucial not to rule out TB solely based on the absence of symptoms, especially in high-risk groups.

EP46-1138-21 Effectiveness of hospital-based active case finding using chest X-rays for early detection of asymptomatic TB in Chiangrai, Thailand

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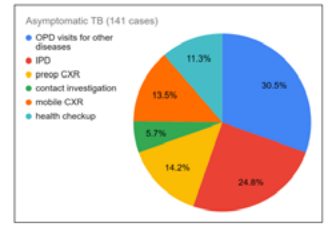
Background: Chiangrai, one of Thailand's provinces with a high tuberculosis (TB) burden and a significant mortality rate associated with TB treatment outcomes. Notably, many patients present to hospital with advanced disease. Active case finding (ACF) is a crucial strategy for improving outcomes by detecting cases earlier, before they progress to severe disease.
This study aims to evaluate a hospital-based ACF strategy using Chest X-rays (CXR) for TB detection and to classify TB types according to the WHO's new definitions introduced in 2024.
Design/Methods: A retrospective analysis of the TB registry data was conducted, categorizing TB detection using CXR into seven groups based on systematic screening methods:
1. Passive Case Finding (PCF): Walk-in patients with TB symptoms.
2. Active Case Finding (ACF) Methods:
   Outpatient department (OPD) visits for other diseases
   Inpatient admission
   Preoperative evaluation
   Contact investigation
   Mobile CXR screening
   Health checkup

Descriptive analysis was performed to examine these categories.
Results: A total of 320 pulmonary TB cases registered in 2024 were reviewed. Among these, 117 cases (36.6%) presented with TB symptoms (PCF), while 203 cases (63.4%) were detected without reported TB symptoms through systematic ACF methods.
Among all cases, 141 (44%) were asymptomatic TB (aTB), with detection settings including:
   30.5% during OPD visits for other diseases
   24.8% during inpatient admission
   14.2% during preoperative evaluation
   The remaining 30.5% shown in a picture

Of the 141 aTB cases:
   53 (37.6%): Bacteriologically confirmed (aTB-C).
   88 (62.4%): Bacteriologically unconfirmed (aTB-U).



	Bacteriologically confirmed	Bacteriologically unconfirmed
Symptomatic	123	56
Asymptomatic	53	88

320 pulmonary TB cases registered in 2024 at Chiangrai Hospital, Thailand

Conclusions: This study highlights the effectiveness of a hospital-based ACF strategy using CXR for early detection of TB. A significant proportion of TB cases were identified in patients who did not report TB symptoms and more than one-third of aTB cases were bacteriologically confirmed TB (aTB-C), underlining the importance of ACF among asymptomatic patients. These findings reinforce the value of Hospital base systematic ACF strategies in high-burden countries.

EP46-1139-21 Enhancing asymptomatic TB detection through active case finding initiatives using PDX machines and mobile X-ray vans in Lagos, Nigeria

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Background and challenges to implementation: Nigeria is first in Africa in Tuberculosis (TB) burden with a 32% gap in TB case notification. Lagos accounts for estimated 10% of Nigeria's TB burden. Lagos TB Programme placed on treatment: 18,546 and 19,052 people affected by TB in 2023 and 2024 respectively.
However, there have been different innovative approaches and strategies deployed to reduce this notification gap from Y2019-Y2024 and to enhance accessibility and coverage of TB services.
Intervention or response: Portable digital X-ray machines and 3 Easy DR mobile trucks are implementing ACF mobile clinics across 20 LGAs in Lagos, where urban poor, migrants, skilled workers, factory workers, artisans and other vulnerable people are concentrated. The mobile teams are equipped with digital chest X-ray augmented with computer-aided detection (CAD) technology. Assigned staff conducted parallel screening in attendees for any TB symptom and CXR and requested sputum samples from those with presumptive TB for diagnostic evaluation.
Results/Impact: Between 2023 and 2024, both innovative AI enabled equipment screened 206,599 attendees using CXR CAD, in which 24,386 cases were flagged as presumptive TB with both CAD and symptom screening. After evaluating CXR findings, clinical presentation, and bacteriological results, 8,282 people were diagnosed with TB among which 3,327(40%) of them were bacteriologically confirmed (BC). Of the 8,282 people with TB, 1,242 (15%) had no TB symptoms. A
mong these diagnosed TB cases with no symptoms, 348(28%) were BC. The findings revealed the high occurrence of subclinical TB and the efficacy of CXR in detecting it.

Conclusions: Asymptomatic TB cases often go undetected due to a lack of symptoms, delaying diagnosis and increasing the risk of transmission. Implementing TB screening using chest X-rays, with or without computer-aided detection, in mobile clinics can enhance early detection, including subclinical cases by reaching communities. This proactive strategy is essential for achieving END TB targets and lowering the national TB burden.

EP46-1140-21 Prevalence and factors associated with asymptomatic pulmonary TB: A secondary data analysis of Uganda TB prevalence survey conducted in 2014-2015

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Background: Nearly half of people with tuberculosis in the population are estimated to have asymptomatic TB but are often missed because most TB screening programs rely on symptoms to initiate diagnostic evaluation. Early detection and treatment of asymptomatic TB can improve patient outcomes and halt transmission of TB.
We assessed the burden and factors associated with asymptomatic TB to inform strategies for early TB case detection, treatment, and control.
Design/Methods: We conducted secondary data analysis of the Uganda TB prevalence survey (2014-2015) and included for analysis bacteriologically confirmed TB cases by culture or Xpert MTB/RIF. We calculated the weighted prevalence of asymptomatic TB for three case definitions, namely, "no persistent cough for $\geq$ 2 weeks," "no cough of any duration," and "no TB symptoms," and performed multivariable logistic regression analysis to identify the associated factors.
Results: Among the 41,003 eligible participants included in the final analysis, 160 had bacteriologically confirmed TB. The overall TB prevalence was 392 cases (95% CI: 336, 458) per 100,000 population, while the prevalence of asymptomatic TB was 195 cases (156, 243), 120 cases (91, 158), and 65 cases (44, 94) per 100,000 population when defined as "no persistent cough for $\geq$2 weeks," "no cough of any duration," and "no TB symptoms," respectively.

Having asymptomatic TB, when defined as "no cough of any duration," compared to symptomatic TB was significantly associated with age ≥55 years, HIV infection, current smoking, and living in an urban setting.

Variable	Participants screened (n)	All TB cases (n)	Prevalence (Number of cases per 100,000 pop. 95% CI)	Asymptomatic TB (defined as "no persistent cough for 2 weeks or more")	Prevalence (Number of cases per 100,000 pop. 95% CI)	Asymptomatic TB (defined as "no cough of any duration")	Prevalence (Number of cases per 100,000 pop. 95% CI)	Asymptomatic TB (defined as "no any TB symptoms")	Prevalence (Number of cases per 100,000 pop, 95% CI)
Total (N)	41,003	160	392 (336, 458)	80 (50%)	195 (156, 243)	50 (31%)	120 (91, 158)	27 (17%)	65 (44, 94)
Male	17,405	119	670 (560, 803)	62	346 (270, 445)	39	214 (156, 293)	22	120 (79, 183)
Female	23,598	41	171 (126, 233)	18	74 (47, 118)	11	45 (25, 81)	5	20 (8, 49)
15-34 years	25,236	73	294 (234, 371)	34	134 (96, 188)	21	81 (53, 124)	12	45 (26, 80)
35-54 years	11,081	60	544 (422, 701)	32	292 (206, 413)	17	155 (96, 249)	10	91 (49, 170)
> 55 years	4,686	27	575 (394, 838)	14	300 (178, 507)	12	254 (144, 447)	5	107 (44, 257)
HIV positive	420	39	9,172 (6761, 12330)	22	5,113 (3384, 7657)	17	3,930 (2451, 6244)	7	1,614 (770, 3351)
HIV negative	3,925	106	2,708 (2241, 3270)	49	1,244 (940, 1645)	28	693 (478, 1003)	16	393 (241, 641)
Unknown	36,658	15	40 (24, 67)	9	24 (13, 47)	5	14 (6, 33)	4	11 (4, 30)

Conclusions: Asymptomatic TB contributed to 17%-50% of the TB burden in the general population depending on the definition used, and was associated with older age ≥ 55 years, HIV infection and living in an urban setting. We recommend scaling up non-symptoms-based strategies such as digital X-ray and rapid molecular tests for TB screening among high risk populations for early TB case detection and treatment initiation.

EP46-1141-21 Breaking the symptom barrier in ACF: Targeting high risk vulnerabilities for efficient asymptomatic TB detection in India

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Background and challenges to implementation: National TB Prevalence Survey in India (2019–21) highlighted that 42.6% of total TB cases that were asymptomatic would have been missed without chest X-rays (CXR). Most screening algorithms begin with symptom screening, thereby inadvertently excluding asymptomatic cases. Furthermore, mobilizing asymptomatic individuals remains challenging due to a lack of tailored outreach strategies.
Intervention or response: William J Clinton Foundation (WJCF), through The Global Fund's C19RM grant and under the aegis of the Central TB Division (Government of India), implemented Integrated ACF camps utilizing Artificial Intelligence (AI) enabled ultraportable X-Ray machines across 11 Indian states. WJCF adopted a parallel screening approach that also offered CXR to Key & vulnerable populations (KVPs), including asymptomatic individuals. These KVPs were identified by leveraging existing public health databases/records, contextual grassroot intelligence, engagement of frontline health cadres, and community influencers. Targeted beneficiaries received customised Information, Education, and Communication (IEC) materials and „Priority camp tickets" that encouraged and incentivized participation.
Results/Impact: The data analysed is for the period April 2023 – February 2025. Among over 600,000 asymptomatic individuals screened from vulnerable cohorts, 1,044 bacteriologically confirmed TB cases were identified. Certain risk factors demonstrated notably higher detection efficiencies: individuals with BMI <18.5 had the lowest Number Needed to Screen (NNS = 200), followed by tobacco users (NNS = 415), and alcohol users (NNS = 452).

Vulnerability / Risk-Factor$	Total Asymptomatic TB confirmations, % of total Confirmation	NNS* (Bacteriologically Confirmed)	NNT# (NAAT)	NNT (Smear Microscopy)
BMI Score <18.5	423, 41%	200	21	41
Tobacco User	378, 36%	415	29	64
Alcohol User	122, 12%	452	31	107
Contact person	103, 10%	507	28	88
Diabetes (Self-Reported)	130, 12%	657	49	224

$ The cohorts only include asymptomatic beneficiaries
*NNS – Total number to be screened for 1 TB confirmation
#NNT – Total number to be tested for 1 TB confirmation

Conclusions: For geographies with high proportions of vulnerable populations and constrained resources, robust mobilisation strategies focusing on high-yield vulnerabilities are critical. WJCF's targeted ACF algorithm effectively identifies and prioritises groups with the highest risk, aligning with WHO's Global TB report 2024 recommendations. This approach significantly enhances detection rates and early diagnosis of asymptomatic TB.

EP46-1142-21 Diagnosis of asymptomatic TB during the nationwide hundred days campaign and the strategies for additional detection: Evidence from West Bengal, India

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Background: On December 2024, India launched an innovative nationwide campaign called 100 days intensified TB campaign to find the missing person with TB (PwTB) in the community. This is an effort towards reaching out to those vulnerable individuals (undernourished, close contacts of PwTB, people with diabetes, smokers, alcoholics) who by virtue of having these conditions/situations could be having active TB disease with or without classical symptom of Tuberculosis. All mapped vulnerable population were initially screened using 10 symptoms of TB. In the next step all asymptomatic vulnerable population were screened using Chest X-ray (CXR).
During this campaign India as well as the State of West Bengal could achieve additional TB case detection including asymptomatic TB.
Design/Methods: This is an observational study. A secondary analysis was conducted to calculate the yields & outputs of asymptomatic TB case finding strategies. The study also explores the gaps in the strategies if there was any.

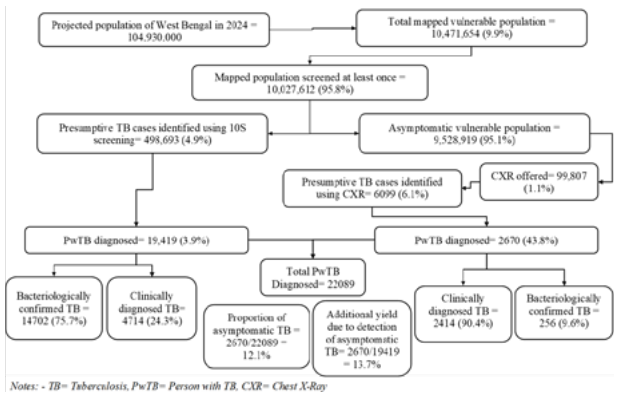

Figure 1. Flowchart depicting the number and percentage of participants at different stages of 100 days intensified TB campaign in West Bengal during Dec '24 - Mar '25

Results: A total of 2670 PwTB detected after evaluation of 6099 asymptomatic person having abnormal CXR. The TB diagnostic yield was 43.8%. On the other hand, 19,419 PwTB diagnosed through symptom screening. Asymptomatic TB detection strategies gave an additional yield of 13.7% (2670/19419). Among the eligible vulnerable population, 1.05% were offered CXR during the campaign period. Mean age of asymptomatic PwTB was 46.5 yrs (SD=18.4). 67.1% were male, 5.8% were 60 yrs or above, 11% were smoker. 60.2% was pulmonary TB & 39.8 % Extrapulmonary TB. Among the Extrapulmonary TB, majorities (82.1%) was pleural TB. 9.6% asymptomatic PwTB was bacteriologically confirmed. *(Fig.1)*
Conclusions: 100 days campaign was fruitful in terms of additional TB case detection including asymptomatic TB cases in West Bengal. With provision of a greater number of X-ray machines, especially portable X-ray suitable for hard-to-reach areas, a greater number of cases could be detected through such campaign.

EP46-1143-21 Tongue swab qPCR for asymptomatic TB screening: A high-accuracy alternative to sputum RMT and AI-based CXR in the general population

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Background: Tuberculosis (TB) remains a leading global cause of infectious disease-related mortality, despite persistent diagnostic challenges. Tongue swabs quantitative PCR (qPCR) are gaining attention as a potential alternative to sputum-based methods and chest radiograph (CXR), though its diagnostic capability and limitations are still under investigation.
This study aimed to evaluate and compare the diagnostic accuracy of tongue swab and AI-based CXR screening in a general population within a high-TB-burden district in Guizhou, China.
Design/Methods: Two screening modalities of AI-based CXR and tongue swab qPCR were conducted among 1,502 general residents in Guizhou Province. Individuals showing any imaging abnormalities or positive tongue swab qPCR results were considered screening positive and underwent confirmatory testing using standard sputum qPCR.
Results: Among 1,502 participants, 53.2% were female, and median age was 52 years. Prevalent TB was identified in four cases, all of which were asymptomatic. Tongue swab screening demonstrated a high diagnostic accuracy of 99.87% compared to standard sputum qPCR, detecting three TB cases (3/4, sensitivity 75.00%; 1495/1497, specificity 99.93%), with one of four cases being missed by AI-

based CXR. The number needed to test (NNT) one TB case was 1.3 (4/3) for tongue swab screening, compared to 38 (76/2) for AI-based CXR. AI-based CXR supplementation detected one additional TB cases (2/4, sensitivity 50.00%; 1424/1498, specificity 95.06%) that was undiagnosed by tongue swab.
Conclusions: AI-based CXR missed 50% of these asymptomatic cases. Our findings provide critical insights into the potential of tongue swab-based screening, highlighting its diagnostic accuracy and utility, particularly in asymptomatic populations. Further validation in diverse populations is warranted.

EP46-1144-21 Bio-phenotyping undetected TB: Is asymptomatic TB infectious and what is the role of chest radiography?

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Background: Asymptomatic tuberculosis (TB) represents approximately half of the global TB burden. However, data describing this disease state is limited, including whether these individuals are probably infectious. We aimed to bio-phenotype asymptomatic TB during community-based active case-finding (ACF).
Design/Methods: Individuals with microbiologically confirmed TB (sputum Xpert MTB/RIF Ultra and/or culture positivity), recruited from three large-scale, multicentre, community-based ACF studies, were included. Clinical, microbiological, and radiological data obtained from asymptomatic TB were compared to symptomatic TB. A subset of participants (n=100) underwent fluorodeoxyglucose-positron-emission-tomography-computed-tomography (PET-CT), of which 63/100 (63.0%) were asymptomatic. Chest X-rays (CXRs) were analysed by two expert human readers and computer-aided detection (CAD: CAD4TB v7 and qXR v4.3). Performance of the human reader and CAD to detect TB-related lung abnormalities were evaluated (PET-CT was the radiological reference standard). Probable infectiousness was defined as smear positivity and/or cavitary disease and/or cough aerosol-sampling (CASS) positivity (quantification of culture-positive <5µm cough-aerosol particles).
Results: A total of 17,985 individuals were rapidly questionnaire-screened, of which 7,407 (41.2%) screened positive and were enrolled to undergo diagnostic investigation. 388/7,407 (5.2%) had microbiologically confirmed TB. 153/388 (39.4%) had asymptomatic TB, of whom 35/153 (22.9%) were smear-positive and 42/153 (27.5%) had cavitary disease on CXR. Of the 63 asymptomatic persons who had PET-CT, 36/63 (57.1%) had cavitation of which 17/63 (26.9%) were missed on CXR. CXRs were more frequently reported as 'normal' in asymptomatic TB versus symptomatic TB (21/63 [33.3] vs 3/37 [8.1]; p=0.012). CAD (qXR v4.3) had an area-under-the-curve (AUC) of 0.81 (0.73-0.88) in detecting cavitary disease, but performed sub-optimally in asymptomatic TB (AUC 0.76 [0.66-0.85]). Overall, 61/153 (39.9%) individuals with asymptomatic TB were probably infectious.
Conclusions: More than a third of individuals with asymptomatic TB were probably infectious, with over a quarter of cavitary disease missed on CXR. These data inform disease burden estimation and community-based ACF strategies in endemic settings.

EP46-1145-21 Evaluation of the PATHFAST TB LAM Ag assay in minimally symptomatic and subclinical TB cases and assessing its performance against established laboratory diagnostic tests

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Background: The current gold standard for the diagnosis of active TB is MGIT culture. However, this method poses many challenges; its performance is poor in paucibacillary cases, it can take several weeks to yield results, it requires a decent laboratory infrastructure with trained personnel, and contamination can nullify results. The PATHFAST TB LAM Ag assay uses chemiluminescence to measure lipoarabinomannan (LAM) in sputum samples. Compared to MGIT culture, the test requires a smaller sample volume (250µL), provides a quick turnaround time for results (<20 minutes) and a reasonably low limit of detection.
Design/Methods: Frozen sputum samples from 120 actively diagnosed individuals, positive for *M. tuberculosis* (GeneXpert and/or MGIT culture and/or smear microscopy) and 58 TB-negative controls were decontaminated, loaded onto the PATHFAST TB LAM Ag cartridges and run. Samples that were out of range were diluted 10-fold and re-run. The assay performance was evaluated against the other diagnostic outcomes and the impact of biobehavioural characteristics on the assay was assessed.

Results: Using culture as reference standard, the PATHFAST TB LAM Ag at a cut-off of 10 pg/mL displayed a sensitivity of 61.6% and specificity of 86.7%. Sensitivity was higher (77.5%) for sputum MGIT time-to-positivity ≤8 days. Overall, its sensitivity was superior to smear microscopy (61.6% vs 30.1%) while its specificity was better than the GeneXpert (86.7% vs 55.2%). PATHFAST LAM Ag correlated well with time-to-positivity (R=-0.49; p<0.0001), GeneXpert Ct (R=-0.63; p<0.0001) and smear grade (R=0.56; p=0.005). The median LAM Ag level was significantly higher in smokers (2.8 vs 1.2 pg/mL; p=0.01) and symptomatic individuals (9.9 v/s 1.4 pg/mL;p=0.0001) compared to asymptomatic individuals.
Conclusions: The PATHFAST TB LAM Ag assay provides a promising alternative to MGIT culture. The relatively good diagnostic performance in minimally symptomatic and subclinical TB cases highlights its potential as a tool in TB control, treatment evaluation and research in general.

EP46-1146-21 Improving diagnosis of asymptomatic TB among people living with HIV using digital chest X-ray with computer-aided detection in Nigeria

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Background: Diagnosis of asymptomatic tuberculosis (TB) in people living with HIV (PLWH) can be challenging using conventional screening methods. It is estimated that approximately two-thirds of global TB transmission may be attributed to asymptomatic TB. The KNCV Nigeria implemented an active TB screening program among PLHIV using portable digital Chest X-ray (CXR) with artificial intelligence (AI) applied to a parallel TB screening algorithm, followed by TB diagnostic testing of presumptive with sequential confirmatory test algorithm. This study assessed the magnitude and characteristics of asymptomatic TB among PLHIV and the relative contributions of clinical diagnosis in its identification in Nigeria.
Design/Methods: This was a retrospective review of medical records of PLHIV screened for TB using a parallel method consisting of any TB symptoms (cough, fever, weight loss, or night sweats) and CXR-AI from October 2023 to September 2024 across 14 health facilities in 3 states. The primary outcome measure is the percentage of asymptomatic TB among PLHIV diagnosed with TB and the prevalence of asymptomatic TB by diagnostic method. Demographic and clinical classifications were compared between asymptomatic and symptomatic TB groups.
Results: Of 7,407 PLHIV screened for TB, 914 presumptive TB clients were identified. Among these, 499 (54.6%) had no TB symptoms (males: 35%, females: 65%). The median age was 34 (interquartile range: 20 – 50) years. The overall prevalence of TB among all presumptive was 39.7% (n = 363), including 206 (56.7%) asymptomatic TB and 157 (43.3%) active TB cases. The proportion of clinical diagnosis using CXR was significantly higher in the asymptomatic TB group than in the active TB group (97.6% vs. 73.2%; P = 0.034, OR = 0.75, 95% CI 0.55–1.02).
Conclusions: Asymptomatic TB contributed 56.7% of the TB burden in this study (40 per 100 presumptive). Diagnosis of such people would have been missed if symptom-only TB screening had been applied.

EP47 Enhancing TB care: Innovations in drug therapy, pharmacokinetics and treatment strategies

EP47-1147-21 Geographical representativeness of participants enrolled in randomised trials for TB treatment: A systematic review

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Background: Most people who develop TB disease each year are in 30 high TB burden countries, which accounted for 87% of the global total in 2023. Five countries accounted for 56% of the worldwide total: India (26%), Indonesia (10%), China (6.8%), the Philippines (6.8%) and Pakistan (6.3%).
Geographical representativeness in clinical trials is critical because the efficacy and safety profile of new interventions may vary regionally due to ethnic differences and circulating strains of *Mycobacteria*. Implementation also benefits from studies conducted in the same country or region. This systematic review aimed to evaluate TB treatment trial locations and to identify gaps in trial distributions.
Design/Methods: MEDLINE, Embase and the Cochrane Central Register of Controlled Trials databases were searched from January 1993 to February 2025 for randomised TB treatment trials reporting efficacy endpoints with at least six months of follow-up after the end of treatment.
Studies on TB infection, vaccines, alternative formulations of standard drugs, supplements, or adherence/system-related mechanisms were excluded. Only full-text studies in English were included. The review was registered in PROSPERO (CRD420251002693).
Results: We identified 7273 articles, of which 62 were suitable for analysis (6 had incomplete data). Thirty-one (50%), 26 (41.9%), 24 (38.7%), 13 (21%), 10 (16.1%) and 2 (3.2%) studies recruited participants from WHO South-East Asian, Western Pacific, African, American, European and Eastern Mediterranean Regions, respectively.
Only 6 (9.7%), 2 (3.2%) and 1 (1.6%) studies recruited from the Philippines, Pakistan and Indonesia. A total of 30128 participants were included; 7514 (24.9%), 3678 (12.2%) and 2688 (8.9%) were from India, South Africa and China, respectively.
Conclusions: Geographical distribution of participants in TB trials over the past three decades is only partially representative of people with TB. Countries like Indonesia, Pakistan and the Philippines are underrepresented. Greater efforts are needed to support late-stage clinical trials in these countries.

EP47-1148-21 Population pharmacokinetic modelling of standard- and high-dose rifampicin for TB preventive therapy in the 2R² randomised controlled trial

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Background: Recent studies suggest that high-dose rifampicin could improve tuberculosis treatment, raising interest in its potential to shorten tuberculosis preventive therapy (TPT) in individuals with tuberculosis infection. However, rifampicin pharmacokinetics in this population remain poorly characterized. We aimed to characterize rifampicin pharmacokinetics and identify factors contributing to variability in exposure to standard- and high-dose rifampicin for TPT.
Design/Methods: Intensive and sparse pharmacokinetic sub-studies were conducted in Indonesia, Canada, and Vietnam among participants in the 2R² randomized controlled trial (NCT03988933), which compared TPT regimens of two months of high-dose rifampicin (20 or 30 mg/kg/day) with four months of standard-dose rifampicin

(10 mg/kg/day) in adolescents and adults aged ≥10 years. Venous blood samples were collected after 2–8 weeks of treatment. Rifampicin pharmacokinetics were analyzed using nonlinear mixed-effects modeling in NONMEM.

Results: Among 1,368 trial participants, 460 (34%) underwent pharmacokinetic sampling (51 intensive and 409 sparse; median age, 41 years). Of these, 170 (37%), 148 (32%), and 142 (31%) were randomized to the 10, 20, and 30 mg/kg/day dose groups, respectively. A one-compartment model with saturable hepatic extraction and transit-compartment absorption best described rifampicin pharmacokinetics. All disposition parameters were allometrically scaled using fat-free mass. Rifampicin bioavailability was 24% (95%CI: 20-29%) and 15% (95%CI: 9-21%) lower in Canada and Vietnam, respectively, compared to Indonesia. No other significant covariates were identified. Visual predictive checks and nonparametric bootstrap analysis indicated good model performance. Rifampicin total exposure increased more than proportionally with dose (median 24-hour area under the concentration-time curve: 64, 154, and 248 mg*h/L for 10, 20, and 30 mg/kg/day), exceeding levels typically observed in individuals with tuberculosis disease.

Conclusions: High-dose rifampicin for TPT resulted in greater-than-proportional exposure due to non-linear clearance at higher doses, with between-country variability affecting exposure. These findings are important for determining exposure-response relationships and should be considered when designing future trials involving high-dose rifampicin.

EP47-1149-21 Is rifampin as part of fixed-dose combination tablet optimal for people in the with TB? A population pharmacokinetic study

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Background: Tuberculosis (TB) patients admitted to intensive care units (ICU) have high mortality rates. It is uncertain whether the pharmacokinetics of first-line TB drugs in ICU patients are different from outpatients. This study aims to compare the pharmacokinetics of oral rifampin when administered as a fixed-dose combination tablet in TB patients in ICU versus TB outpatients.

Design/Methods: A prospective pharmacokinetic (PK) study was performed in Amazonas State, Brazil. Various socio-demographic, clinical and severity of disease data were collected to explain interpatient pharmacokinetic variability. Probability of target attainment (PTA) was determined using AUC > 34.4 and C_{max} > 8.2 values. Optimized dosing regimens were simulated at steady state.

Results: Five ICU and thirteen outpatients were enrolled. Pharmacokinetic parameter estimates are provided in Table 1. All pharmacokinetic parameters for ICU patients, except volume of distribution (V) and intercompartmental transfer rate constant from the central to the peripheral compartment (KCP), were significantly different to outpatients and were estimated separately in the model using selective execution statements. A two-compartment model with first-order absorption, linear elimination from the central compartment, central and peripheral V and first-order KCP (Δ -2*LL: -555.7; ΔAIC: -576.8) best described the data. The inclusion of total bilirubin and total body weight as a covariate with an allometric scaler on clearance resulted in a significant reduction of the log likelihood ratio (Δ -2*LL: -143.1; ΔAIC: -143.1) and an improvement of the model fit. Thus, the final equation was CLt = CL * (0.75/BILIRR) * (WEIGHT/60)**0.75. On PTA analysis, an AUC > 34.4mg.h/L was achieved by 65.6% of outpatients and 76.9% of ICU patients. None of patients achieved C_{max}>8.2mg/L on this research.

	ICU (n = 5)			Outpatients (n = 13)			P-value
Parameter	Mean (SD)	Median	%CV	Mean (SD)	Median	%CV	
CL/F (L/h)	1.5 (1.5)	0.427	97.8	5.7(4.1)	4.8	71.4	0.0016
V/F (L)	29.2(4.6)	31.3	15.9	32.6(11.7)	28.5	35.8	0.1734
Ka (h^{-1})	0.395(0.12)	0.368	31.8	0.426(0.11)	0.427	27.5	0.0002
KCP	0.655(0.239)	0.750	36.4	0.286(0.12)	0.299	82.4	0.6331
KPC	0.617(0.256)	0.562	41.5	0.063(0.17)	0.010	280.5	0.0004
F 1st dose	0.83(0.08)	0.83	9.7	0.88(0.08)	0.88	9.16	0.0140
F 2nd dose	0.80(0.04)	0.80	5.7	0.54(0.06)	0.52	11.1	0.0002

Table 1: Estimates of Rifampicin pharmacokinetic parameters for the final covariate model (CL, relative clearance; V, relative volume of distribution; Ka, absorption rate constant; F, bioavailability for the 1st and 2nd dose, respectively; KCP, first-order intercompartmental transfer rate constant from the central to the peripheral compartment; KPC, first-order intercompartmental transfer rate constant from the peripheral to the central compartment; SD, standard deviation; CV, coefficient of variation.)

Conclusions: Compared to outpatients, ICU patients displayed significantly different pharmacokinetics for an oral fixed-dose combination administration of rifampin. Total bilirubin and total body weight were important covariates influencing pharmacokinetic parameters.

EP47-1150-21 Could first-line anti-TB drugs in fixed-dose combination tablets be administered through a nasogastric tube? A pharmaceutical technology assay

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Background: Despite parenteral administration of first-line anti-TB drugs is recommended in ICU, it is unavailable in many high TB burden countries. Therefore, fixed-dose combination (FDC) tablets are crushed and delivered through a nasogastric tube (NGT). Modifying the original pharmaceutical form can alter pharmacokinetic properties, compromising therapeutic efficacy.
Thus, this study aims to evaluate factors influencing the administration of FDC tablets containing RHZE via NGT by a pharmaceutical technology assay.
Design/Methods: Weight and disintegration were tested according to pharmacopeia standards. Tablets were crushed and water dissolved up to suspension, delivered via NGT.
A factorial design Box-Behnken 3^3 (n=15) was used as experimental design to evaluate retention index. Three independent variables: tablet preparation, NGT size and infusion volume were analysed.
Immediate release tablets containing rifampicin (R) 150mg, isoniazid (H) 75mg, pyrazinamide (Z) 400mg, and ethambutol (E) 275mg were used. All elements were weighed at the beginning and at the end of two 20ml flushes. The first flush was used to rinse the accessories (beaker, spatula, syringe, and pestle).
Results: Average pill mass was 1248mg ± 17mg (SD = 1.4%; n=80). Tablets comprise 72% active compounds and 28% excipients, disintegration occurred within 4 minutes, confirming the expected behaviour of immediate-release coated tablets.
Statistical analysis revealed an average residue loss of 20.8% (5.7%-54.7%) and high standard deviation (±18.11%). Gauge and length of NGT were the variables with higher impact retaining tablet particles during the process of suspending and delivering.
Fragmented and pulverized tablets administered in FR 8 (100cm) or FR10 (120cm) presented the lower losses during the process, 5.7% and 10.4% respectively. Infusion volume (20ml, 30ml, 40ml) did not significantly influence the result.
Conclusions: Key factors minimizing losses during FDC tablets containing RHZE include tablet fragmentation and pulverization prior to a 5-minute dilution period; utilization of 8 FR (100cm) and 10 FR (120cm) NGT. Bioavailability was not evaluated.

EP47-1151-21 Cerebrospinal fluid penetration of pyrazinamide, levofloxacin and linezolid in people with pulmonary TB

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Background: Tuberculous meningitis (TBM) is the most severe form of tuberculosis (TB). TBM treatment guidelines are based on pulmonary TB regimens and overlook CNS drug penetration. We characterized CSF penetration of pyrazinamide, levofloxacin, and linezolid in pulmonary TB patients.
Design/Methods: This study included MDR-TB patients receiving WHO-recommended regimens for 24 weeks. Blood samples and a single CSF sample were collected at week 24 (±1 week) and quantified using validated LC-MS/MS assays.
Data were analysed using nonlinear mixed-effects modelling. Previously reported pharmacokinetic models from similar populations were used to fit plasma data. CSF concentrations were characterized by an effect compartment linked to plasma, estimating plasma-to-CSF equilibrium half-life ($T½_{plasma\text{-}CSF}$) and CSF-to-plasma ratio ($Ratio_{CSF\text{-}plasma}$), describing delay and extent of CSF equilibration relative to plasma at steady state.
Results: Data included 51 plasma and 12 CSF observations each for pyrazinamide and levofloxacin from 12 participants (50% with HIV), and 37 plasma and 9 CSF linezolid observations from 9 of them. The cohort had a median (min–max) age 45 (30–55) years, weight 52 (43–65) kg, and fat-free mass 44 (29–52) kg.
Pyrazinamide, levofloxacin, and linezolid CSF concentrations equilibrated with plasma with $T½_{plasma\text{-}CSF}$ of 0.46 h, 2.2 h, and 0.80 h, and $Ratio_{CSF\text{-}plasma}$ of 0.95, 0.55, and 0.38, respectively.
After adjusting for previously reported unbound plasma fractions (*fu*) (pyrazinamide: 0.93; levofloxacin and linezolid: 0.70), $Ratio_{CSF\text{-}plasma}$ increased to 1.02, 0.78, and 0.55, respectively. HIV status, antiretroviral therapy, or other covariates did not affect CSF penetration.

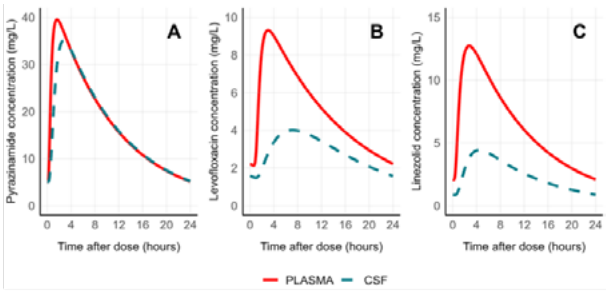

Figure. Simulated steady-state plasma and CSF concentration-time profiles for the typical individual in the cohort with a body weight of 52 kg and a fat-free mass of 44 kg: (A) Pyrazinamide, (B) Levofloxacin, and (C) Linezolid.

Conclusions: Pyrazinamide, levofloxacin, and linezolid CSF concentrations approached or exceeded their respective plasma *fu*, suggesting good CSF penetration and supporting further clinical evaluation in TBM. The CSF penetration observed in this study aligns with previous reports, including TBM cohorts, demonstrating that applying this methodology in small non-TBM cohorts can provide useful CSF drug penetration assessments for CNS infections.

EP47-1152-21 Improving phase 2a efficacy predictions through parent/metabolite analysis: Insights from bedaquiline

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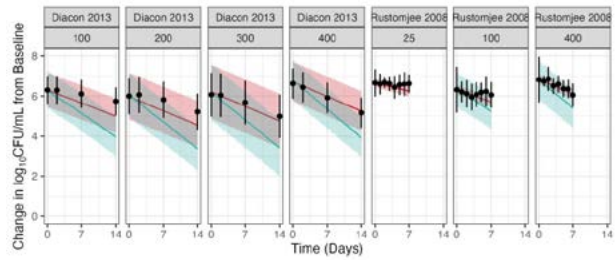
Background: Phase 2a tuberculosis trials typically use early bactericidal activity (EBA), defined as the decline in sputum CFU over 14 days, as the primary endpoint for testing drug efficacy as monotherapy. Better utilization of pre-clinical data to predict and prioritise drugs likely to succed can accelerate development and reduce costs. Many drugs have active metabolites, making it crucial to account for parent/metabolite ratios between species to characterize the true parent efficacy.
We showcase improved predictions using bedaquiline, leveraging pre-clinical in vivo pharmacokinetic (PK)-pharmacodynamic (PD) data and a model-based translational pharmacology approach.
Design/Methods: Mouse PK, PD and clinical PK models were compiled, including bedaquiline and its main metabolite M2. Mouse PK-PD models were built to derive an exposure–response relationship, assuming potency differences between bedaquiline and M2 equal to in vitro MIC values (1:8 bedaquiline:M2).
Translational prediction of clinical EBA studies were performed using refined mouse PK-PD relationships informed by clinical PK models.
Results: A PK model including bedaquiline and its metabolite was built, adequately predicting mouse data. Mouse efficacy was well described by a model including both entities, assuming 1:8 reduction in M2 potency compared to bedaquiline. A reduction in Emax and EC50 compared to the modelling of bedaquiline alone was observed (Emax = 0.254 vs 0.515 and EC50 = 0.12 vs 0.23). Predicted daily CFU decreases in the first 14 days of treatment were consistent with clinical observations, improving previous overoptimistic predictions[1].



Conclusions: Understanding metabolic pathways early in drug development is crucial, especially when metabolite(s) are active compounds. This improved understanding of metabolite activity enhances translation power, improving PKPD translations compared to using the parent drug alone. Assuming in-vivo potency mirrors in vitro MICs aids efficacy predictions.

EP47-1153-21 Pretomanid exposure is not increased by severely impaired renal function

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Background: This Phase 1, open-label, single-dose study, was designed to investigate the safety and pharmacokinetics (PK) of pretomanid in participants with impaired renal function.[1]
Design/Methods: Part A included 6 participants with severe renal impairment (defined by eGFR), including 1 with end-stage renal disease not on dialysis (group 1), and 6 healthy controls matched by race, gender, age, and BMI (group 2);
Part B was planned to enroll participants with moderate and mild renal impairment only if Part A demonstrated at least a 50% increase in the mean pretomanid area under the plasma concentration-time curve (AUC) in group 1 compared to group 2.
The study was conducted at 2 investigational sites. All participants received a single oral dose of pretomanid 200 mg with a high-fat, high-calorie breakfast. Plasma PK was assessed 1 hour pre-dose and at 1, 2, 4, 5, 6, 8, 12, 16, 24, 36, 48, 72, and 96 hours post-dosing.

Results: Mean pretomanid AUC was not increased by >50% in participants with severe renal impairment relative to controls with normal renal function. All but one of the renally impaired participants had reduced pretomanid exposure relative to their matched controls. Mean Cmax was 1470 ng/mL in participants with renal impairment and 2173 ng/mL in healthy controls. Mean $AUC_{0-\infty}$ was 73.8 mg*hr/L in renally impaired participants and 88.7 mg*hr/L in the control group. Treatment was well tolerated, with few adverse events (AEs) and no serious AEs reported.

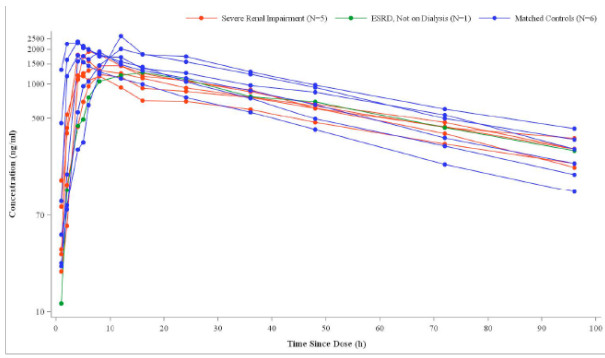

Figure. Pretomanid Plasma Concentrations Individual Time Curves.

Conclusions: Based on the PK results, the study monitoring committee concluded there was no need to proceed to Part B of the study. In conclusion, renal impairment does not increase pretomanid exposure.

1. This work was supported by the Division of Microbiology and Infectious Diseases at the National Institutes of Health under contracts HHSN272201300021I and 75N93022D00018.

EP47-1154-21 Effectiveness and safety of a shortened oral regimen for multi-drug-resistant/rifampicin-resistant in Peru

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Background: Drug-resistant tuberculosis (TB) poses a significant threat to global public health. Emerging bedaquiline-based, all-oral, shortened treatment regimens (6–12 months) offer a promising alternative to the longer regimens used in the past.
Our aim was to evaluate the effectiveness and safety of a nine-month, all-oral regimen implemented under operational research conditions by Peru's National Tuberculosis Program (NTP).
Design/Methods: We conducted a prospective observational study within the NTP. We consecutively enrolled non-pregnant adults (>18 years of age) with confirmed multidrug-resistant or rifampicin-resistant TB (MDR/RR-TB) from four national referral hospitals. The treatment regimen included bedaquiline, linezolid, levofloxacin, clofazimine, and Delamanid. We assessed treatment outcomes, sputum conversion, and reported adverse events.
Results: Fifty participants with confirmed MDR/RR-TB were included. Of these, 48% were women, and the median age was 28.5 years (IQR: 23–59 years). At baseline, 58% had bilateral pulmonary disease, and 76% had cavitary lesions. Three participants (6%) were excluded due to baseline fluoroquinolone resistance. The median time to sputum conversion was 39 days (IQR: 31–61 days). The rate of favorable treatment outcomes was 85.1% (95% CI: 72.3–92.6%). Twenty-two participants experienced at least one adverse event, most of which were mild. Clinically significant adverse events of special interest (AESIs) were infrequent; only one AESI—myelosuppression—led to permanent discontinuation of medication.

Table 1. End-of-treatment Outcomes of Individuals Initiating Shortened Regimens for MDR/RR-TB in Peru (N = 47)

Treatment Outcomes	N, (%) [95%CI]
Favorable	40, (85.1) [72.3 – 92.6]
Cured	39 (83.0)
Completed +	1 (2.1)
Unfavorable	7 (14.9) [7.4 – 27.7]
Died	2 (4.3)
Failed	1 (2.1)
Treatment extended > 12 months++	1 (2.1)
Lost to follow-up	3 (6.4)

+ One individual completed 9 months of treatment and was reported to be clinically asymptomatic upon finishing the drug regimen, but did not present to the clinic for confirmatory assessment at the end of treatment.
++ One individual considered clinically cured after a total of 15 months of treatment, in the setting of recurrent fluoroquinolone discontinuations due to gastrointestinal intolerance

Conclusions: This nine-month, bedaquiline-based, all-oral regimen for MDR-TB was effective and safe when implemented under operational conditions. It represents a valuable alternative for the treatment of drug-resistant TB.

EP47-1155-21 Linezolid pharmacokinetics among people with TB receiving the newly-introduced BPaL/BPaLM regimen in Georgia

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Background: Linezolid's (LZD) toxicity, the accumulative nature of Bedaquiline (BDQ) and the limited clinical experience with Pretomanid (PA) underscore the importance of therapeutic drug monitoring (TDM) for the BPaL regimen drugs.
Design/Methods: We developed a *novel* Liquid Chromatography/Mass Spectrometry (LC/MS) method for the *simultaneous analysis* of BDQ, PA, and LZD using deuterated internal standards and used it to assess the pharmacokinetic (PK) profiles of DR-TB patients at 2 distinct time points.

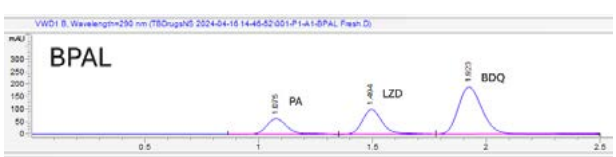

Figure 1. HPLC view of LC/MS simultaneous drug analysis method developed by our team. Peak resolution (Rs) >>1.5 for all peaks, total run time of 2.5min, isocratic elution with less than 1mL eluent waste per run.

In a Prospective Cohort study, we will enroll 30 DR-TB patients receiving BPaL/BPaLM regimens. Utilizing LC/MS simultaneous drug analysis method, BDQ, PA and LZD PK profiles are recorded on 1 and 4 weeks after treatment initiation (PK1 and PK2). PK parameters (C_{min}, C_{max}, AUC, $T_{1/2}$) along with their interpatient and intrapatient variabilities will be assessed.
Results: Out of 16 patients enrolled thus far, data from the first 8 patients (mean age 51 years; 75% male; 13% heavy smokers; 38% MDR/pre-XDR/XDR-TB) and their serum specimens were analyzed. The mean C_{max} values for PK1 and PK2 were 5.4 and 2.5 mg/L for BDQ, 4.5 and 4.9 mg/L for PA, and 14.1 and 13.9 mg/L for LZD. The mean C_{min} values for PK1 and PK2 were 1.8 and 1.3 mg/L for BDQ, 2.7 and 2.82 mg/L for PA, and 0.3 and 0.5 mg/L for LZD. Serum LZD concentrations showed high interpatient variability, σ=6.0 and 4.6 mg/L (PK1 and PK2) for C_{max} and σ=0.4 and 0.9 mg/L for C_{min}.
Conclusions: We developed a fast LC/MS method for simultaneous BDQ, PA, and LZD analysis and utilized it to evaluate the PK parameters of DR-TB patients at two specific time points.

EP47-1156-21 Establishment and application of a method for determination of plasma concentration of sodium aminosalicylate

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Background: Sodium para-Aminosalicylate (PAS) is worth further study in the treatment of drug-resistant tuberculosis. Plasma drug concentration monitoring is gradually carried out in tuberculosis treatment. This study establishes liquid chromatography-mass spectrometry (LC-MS-MS) to determine the concentration of plasma PAS, provides drug monitoring methods for tuberculosis patients treated with PAS, and provides advice for clinical application.
Design/Methods: Liquid chromatography tandem mass spectrometry (LC-MS-MS) was established to determine the concentration of plasma PAS. After protein was precipitated by acetonitrile solution containing internal standard, the chromatographic column was waters HSS T3 column, methanol water formic acid solution (5 mmol / L ammonium acetate, 0.1% formic acid) was used as mobile phase, the flow rate was 0.3ml/min, the column temperature was 30 ℃, and the injection volume was 5 μ L. An electrospray ionization source (ESI source) was used. The scanning mode was multiple reaction monitoring (MRM) and negative ion mode. The standard curve was prepared by liquid-liquid extraction acetonitrile precipitation protein method; The specificity, accuracy, precision and stability of the method were analyzed. The concentrations of plasma PAS in patients were measured.

Results: LC-MS-MS method was established to determine the concentration of plasma PAS. The peak time of PAS is 2.34 minutes, and the peak shape is satisfactor. The curve showed a good linear relationship in the concentration range from 0.1 to 100 μg/ml, and the lowest quantitative (LLOQ) was 0.1 μg/ml, the intra day and inter day precision (RSD) were less than 11.3%. The LC-MS-MS method established in this study had good specificity, and the rate of recovery was 95.1% - 96.3%. This method offers the advantages of simple operation and high recovery rate.
Conclusions: The determination of plasma PAS by LC-MS-MS is sensitive, accurate, simple and stable. It can be used for the determination of plasma concentration of PAS and clinical pharmacokinetics study.

EP48 Surveillance of drug-resistant TB

EP48-1157-21 Characterisation of *M. tuberculosis* drug resistance using targeted next-generation sequencing: Observations from Indonesia

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Background: Drug-resistant tuberculosis (DR-TB) continues to pose a threat to the effort of TB control, with 175,923 people diagnosed with DR-TB globally in 2023 and only 68% treatment success rate. Accurate and comprehensive drug susceptibility testing is an essential component of DRTB care, and in early 2024, the WHO recommended the use of targeted next-generation sequencing (tNGS) for DRTB detection.
Therefore, we aimed to assess and characterize drug resistance profiles among newly diagnosed DR-TB patients using tNGS in West Java, Indonesia.
Design/Methods: Sputum samples from rifampicin-resistant tuberculosis (RR-TB) patients, from May 2024 to February 2025, were collected for tNGS using the Deeplex Myc-TB™. The diagnostic performance of tNGS was compared to phenotypic DST and Xpert MTB/XDR.
Results: In 43 NGS runs, 404 samples were successfully sequenced, yielding an 82% success rate. Spoligotyping identified the Beijing strain as the most common (55.2%), followed by H (6.4%), T (4.2%), LAM (2.9%), and EAI (1.5%). Rifampicin and isoniazid resistance were detected in 97.3% and 60.4% of samples, respectively, with 49.0% classified as multi-drug resistant (MDR), 9.4% as pre-extensively drug-resistant (pre-XDR), and 0.2% as extensively drug-resistant (XDR) TB.
tNGS demonstrated high concordance (80–99%) and specificity (77.5–100%) with standard tests. Sensitivities against pDST and Xpert MTB/XDR exceeded 87.5% for most drugs, except for isoniazid (79.5%) and bedaquiline/clofazimine (50%) due to limited resistance data. tNGS

specificity for Rifampicin was low (7.1%), increasing only to 16.7% after adjusting for borderline mutations, possibly due to the need to obtain subculture isolates altering sample integrity, leading to false positives and reduced specificity.

	pDST (n=363)			Xpert MTB/XDR (n=241)		
Drug	Concordance, %	Sensitivity, %	Specificity, %	Concordance, %	Sensitivity, %	Specificity, %
Isoniazid	83.2	81.3	88.1	85.5	92.5	76.2
Pyrazinamide	84.3	63.6	93.8	-	-	-
Levofloxacin	95.8	84.2	97.2	97.0	95.2	97.3
Moxifloxacin	95.7	87.5	96.6	97.1	95.2	97.3
Linezolid	99.7	-	100	-	-	-
Bedaquiline	97.7	50.0	98.6	-	-	-
Clofazimine	98.0	50.0	98.6	-	-	-
Ethionamide	-	-	-	96.1	89.5	96.7

Table 1. Performance of tNGS compared to pDST and Xpert MTB/XDR.

Conclusions: Our study showed that tNGS demonstrates comparable diagnostic accuracy to current standard drug susceptibility tests. However, additional data are needed, particularly for Group A drugs such as linezolid, bedaquiline, and clofazimine.

EP48-1158-21 Phenotypic and genotypic comparison of anti-TB drug-resistant *M. tuberculosis* in Thailand

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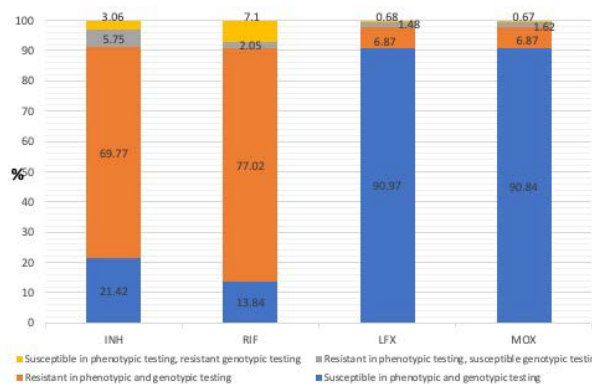
Background and challenges to implementation: Drug-resistant tuberculosis is a global public health challenge. The World Health Organization (WHO) recommends the implementation of a universal drug sensitivity testing (DST) policy in endemic areas, encouraging patients to test for tuberculosis drug sensitivity using both genotypic and phenotypic procedures. The patients with DST were identified and used effective medication.
The aim of this study was to evaluate the concordance and efficacy of genotypic and phenotypic DST in *Mycobacterium tuberculosis* for detecting drug resistance.
Intervention or response: Genotypic comparisons were performed among isoniazid, rifampicin, levofloxacin, and moxifloxacin at the National Tuberculosis Reference Laboratory from 2023 to 2024 utilizing multiple methods (LPA, GeneXpert, Real-time PCR), whereas phenotypic DST was performed using the LJ method and MGIT 960. The concordance between genotypic and phenotypic DST was computed utilizing GraphPad software.

Results/Impact: Levofloxacin and moxifloxacin exhibited a concordance 97.84% (kappa coefficient (K) = 0.853, 95% CI 0.782 - 0.924) and 97.71% (K = 0.845, 95% CI 0.772 - 0.917) respectively, signifying almost perfect agreement between phenotypic and genotypic DST. Concordance rate between phenotypic and genotypic DST results was detected for isoniazid 91.19% (K = 0.770, 95% CI 0.720 - 0.820) and rifampicin 90.85% (K = 0.697, 95% CI 0.634 - 0.760) signifying substantial agreement.
In contrast, the discordance between genotypic and phenotypic DST for isoniazid, rifampicin, levofloxacin, and moxifloxacin was 8.81, 9.15, 2.16, and 2.29, respectively. Discordance pattern was commonly resistant in phenotypic testing, susceptible genotypic testing.



Figures Concordance of the phenotypic and genotypic drug susceptibility testing results of the drug-resistant *M. tuberculosis* isolates. Number of tested isolates for each drug is indicated. Abbreviations: INH, isoniazid; RIF, rifampicin; LFX; levofloxacin, MOX; Moxifloxacin

Conclusions: This study serves as a guideline for medical laboratories in selecting the appropriate methodology for DST. Discordance between genotypic and phenotypic drug susceptibility testing may occur due to the limited coverage of genotypic methods, which primarily target hotspot regions and may overlook resistance-conferring mutations outside these areas. Whole genome sequencing (WGS) will be dissolved the limitation in the next stage.

EP48-1159-21 Genomic variants and associated drug resistance profiles revealed by whole genome sequencing in drug-resistant *M. tuberculosis* clinical isolates from Limpopo province

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Background: The emergence and spread of drug-resistant tuberculosis (DR-TB) pose a threat to its treatment and management. Thus, the study aimed to investigate the genetic variants and associated drug-resistant mutations in DR-TB isolates from Limpopo province

Design/Methods: This quantitative study employed the use of whole genome sequencing (WGS) to characterise 44 drug resistant MTB clinical isolates selected from the Limpopo tuberculosis repository (2021-2023). Isolates were previously characterised by MTBDR*plus* line probe assay as drug resistant. The isolates were subcultured and further incubated for 2-weeks after initial positivity. Illumina protocol was used for sequencing at 50x depth. Lineages, mutations, drug resistance profiles and potential clusters were identified using relevant bioinformatics tools.
Results: WGS characterised resistance to all currently available antituberculosis drugs. The WGS characterised most of the MTB isolates as extensively drug resistant tuberculosis (XDR-TB) (n= 14/44; 32%), followed by pre-extensively drug resistant tuberculosis (Pre-XDR-TB) (n= 10/44; 23%). The Euro-American lineage 4.1.1 dominated most drug resistance profiles with 70% (7/10) in rifampicin resistant tuberculosis (RR-TB) and 54% (7/13) in XDR-TB. The Beijing lineage 2.2.1 (n = 6/10; 60%) was the dominant lineage in pre-XDR-TB, while other strains belonged to Indo Oceanic lineage 1 and 1 mixed lineage 2 & 4. Cluster analysis showed a 17.5% clustering rate mainly in the Waterberg district and Mopani districts.
Conclusions: This study highlights lineage 4 & 2 as major drivers of infection with drug resistant tuberculosis especially in Pre-XDR-TB and XDR-TB in Limpopo province. Therefore, high-quality data linking quantitative phenotypic drug susceptibility testing (DST) and genomic data is needed in Limpopo.

EP48-1160-21 Prevalence of *katG* and *inhA* mutations in genes associated with isoniazid resistance in *M. tuberculosis* clinical isolates in Kazakhstan

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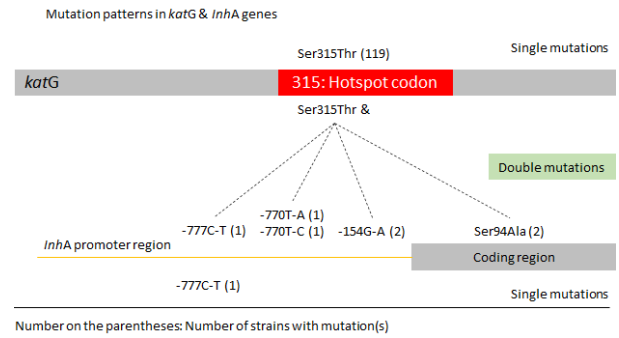
Background: Isoniazid (INH) resistance remains a major challenge in the treatment of tuberculosis (TB), especially in INH-monoresistant and multidrug-resistant TB (MDR-TB) cases. Mutations in the *katG* gene and the *inhA* promoter region are the primary genetic mechanisms underlying INH resistance in *Mycobacterium tuberculosis* (MTB). Understanding the prevalence of these mutations is essential for improving molecular diagnostics and informing TB control strategies in Kazakhstan, where MDR-TB remains a serious public health threat.
Design/Methods: A total of 127 MTB clinical isolates with confirmed INH resistance were analyzed using whole-genome sequencing (WGS). Mutations associated with INH resistance were identified in the *katG* gene, *inhA* promoter, and related regions.
Mutation frequencies were compared to published data from other geographic regions. Clustering and phylogenetic analyses were also performed to explore potential transmission patterns.
Results: Among INH-resistant isolates, the *katG* S315T mutation was detected in 99.21% (126/127) of cases, a significantly higher prevalence than reported in other studies (53–71%). The observed *inhA*-related mutation was -777C>T (1.57%), -154G>A (1.57%), Ser94Ala (1.57%), -770T>A (0.79%), and -770T>C (0.79%). The high frequency of *katG* S315T suggests dominant transmission of resistant strains rather than independent emergence.



Conclusions: The strikingly high prevalence of the *katG* S315T mutation among INH-resistant MTB isolates in Kazakhstan highlights the dominance of a specific resistant clone or lineage. This findings highlight the urgent need to incorporate katG S315T detection into molecular diagnostic tests. The use of the updated Xpert MTB/XDR assay is particularly important, as the older Xpert MTB/RIF test only detects RIF-resistance and may miss INH-monoresistance, which accounts over 10% of cases. Failure to detect INH-resistance can lead to inappropriate treatment and further transmission.

EP48-1161-21 Prevalence and distribution of genomic drug-resistance of anti-TB drugs in West Java, Indonesia

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Background: Drug-resistant tuberculosis (DR TB) cases has been increasing worldwide, including in Indonesia, where it is already the country with second highest TB burden. However, the profile of emerging resistance is not yet mapped, and this becomes even more important with the rollout of new anti-TB drugs such as bedaquiline and linezolid.
Design/Methods: This is an operational research study that coordinates a provincial level health laboratory and 11 Programmatic Management of Drug-Resistant TB (PMDT) hospitals in West Java, the province with highest TB burden in the country. Clinical samples of individuals with reported rifampicin-resistant (RR) results from the recruitment sites were sent to the laboratory.
If the samples pass the quality checking steps, they will be processed with targeted Next Generation Sequencing (tNGS) using Illumina's iSeq100 instrument and GenoScreen's Deeplex Myc-TB kit. Successful tNGS results are then summarized to get resistance profile among DR TB patients in West Java.

Gene	Drug	Resistant	Uncharacterised	Gene	Drug	Resistant	Resistant
katG	INH	156	13	rpsL	SM	41	2
ahpC	INH	8	27	eis	KAN, AMK, CAP	4	6
inhA	INH, ETH	0	4	rrs	KAN, AMK, CAP, SM	16	10
fabG1	INH, ETH	29	3	tlyA	CAP	3	22
pncA	PZA	53	12	ethA	ETH	0	53
embB	EMB	95	5	rplC	LZD	0	2
gyrA	LFX, MFX	28	1	rrl	LZD	0	7
gyrB	LFX, MFX	3	3	rv0678	CFZ, BDQ	6	3
gidB	SM	28	19				

Results: From August 2024 to early March 2025, 300 samples were successfully characterised using tNGS with a median turnaround time of 10.5 days (IQR 8 – 14), starting from when samples were received until tNGS result came out. The majority of the samples (53%; 160/300) were of BEI (Beijing) spoligotype. The most detected drug resistant-associated gene following RIF's rpoB (100%) was katG mutations (related to INH drug, 52%), embB mutations (related to EMB, 31.7%), and pncA (related to PZA, 17.7%). Shared resistance of CFZ and BDQ through rv0678 gene mutation was found in 2% of the samples, and while there was no resistance detected for LZD yet, there were 3% uncharacterised mutations that could be related to LZD detected among the samples.
Conclusions: Most of the samples confirmed drug resistance to mostly first-line anti-tuberculosis drugs, and a regular surveillance is warranted to monitor second-line drug resistance especially in the era of BPaL/M regimen.

EP48-1162-21 Trends in drug-resistant TB in the Democratic Republic of Congo: A 6-year retrospective analysis (2018-2023)

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Background: The detection of drug resistant TB continues to be a challenge for achieving the objectives of the "END TB" strategy in DRC. Only 40% of all expected cases are being diagnosed and put on treatment. Screening for multidrug-resistant TB remains low despite the many efforts implemented by the NTP and partners.
Design/Methods: This retrospective cohort study examined the trends in drug-resistant TB detection, and assessed treatment outcomes. Data were collected from patients followed up between 2018 and 2023 from programmatic management of drug-resistant TB and laboratory registries.
Results: Between 2018 and 2023, 6963 (38%) people were diagnosed with MDR-TB compared to the expected target of 18406. The proportion of children (0-14 years) was 4.3%. About 40% of the expected cases were diagnosed; of these, 90% were initiated to treatment. Overtime, the treatment success rate remained below 90%, and about 12% were lost to follow up in 2023. Mortality rate decreased from 12% in 2018 to 4% in 2023. The gap remains wide for detection and treatment initiation.

Année	Target	Total diagnosed N(%)		Total treated N(%)		Treatment success rate	Death rate	Lost to follow-up
2018	1727	765	44,3	690	90,2	77%	12%	8%
2019	2133	918	43,0	822	89,5	80%	12%	5%
2020	2530	1015	40,1	905	89,2	84%	7%	8%
2021	3532	1236	35,0	1125	91,0	87%	6%	7%
2022	3997	1614	40,4	1403	86,9	87%	5%	8%
2023	4487	1415	31,5	1267	89,5	83%	4%	12%
Total	18 406	6963	37,8	6212	89,2	83%	8%	8%

Table 1 Results.

Conclusions: MDR-TB remains under-detected in DRC. This is challenged by limited access to molecular diagnostic tools (number of GeneXpert, Truenat), sub-optimal sample transportation system, stockout of medicines and reagents, insecurity issues limiting access to TB services especially in mining areas and in the Eastern part of the country.

EP48-1163-21 Shifting narratives of drug-resistant TB enrolment challenges

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Background and challenges to implementation: Nigeria is among 14 high burden DR-TB countries with annual national estimates at 21,000. Sub-optimal notification is a challenge, an abysmal 3,867 cases were notified in 2022. The Institute of Human Virology Nigeria (IHVN) with funding support from Global Fund and USAID TB Local Organization Network (LON) 3 identified and addressed this gap in 4 southwestern states: Lagos, Oyo, Osun and Ogun in Nigeria.
Intervention or response: A retrospective review of program DR-TB data from October 2022-September 2023 was conducted showing an enrollment gap of 46.5% (181/389). A survey amongst healthcare workers in the affected health facilities across the 4 states was conducted to identify reasons for delayed treatment initiation.
This included refusal, denial of diagnosis, inability to reach patients due to incorrect or missing contact information, relocation, and mortality. To address this gap; in December 2023 IHVN implemented patient-centered strategies among individuals diagnosed with DR-TB.
This included specialized patient and family counseling to address fears and misconceptions about DR-TB treatment, systematic tracking of patients through home visits and follow-up phone calls by trained community TB workers and state program teams, inter-state collaboration with DR-TB focal persons to locate and enroll patients who had relocated, improved contact documentation at the point of sputum collection for enhanced patient follow-up. These coordinated efforts aimed to improve patient engagement and ensure timely linkage to care.
Results/Impact: Post-intervention, treatment initiation rate rose from 46.5% to 83.3% (324/389). Leaving 16.7% (65) not enrolled. About 40% (26) had inaccurate contact information, 21.5% (14) died prior to treatment initiation, 32.3% (21) refused treatment and 6.2% (4) had relocated.
Conclusions: Findings from this study highlights the critical need for deploying strategic programmatic interventions and patient centered approaches to address DR-TB enrollment challenges within communities. Implementing and sustaining these strategies is essential in improving treatment uptake and eliminating the vicious cycle of community transmission.

EP48-1164-21 Surveillance of drug-resistant TB, including bedaquiline and delamanid, in Kazakhstan (2020-2024)

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Background: Drug-resistant tuberculosis (DR-TB), including resistance to new anti-TB drugs, poses a significant public health challenge in Kazakhstan. Monitoring resistance trends is essential for effective TB control and treatment strategies.
Design/Methods: A retrospective analysis was conducted on 45,040 adult pulmonary TB patients in Kazakhstan from 2020 to 2024. Patients included 32,349 newly diagnosed and 12,691 previously treated cases. Drug resistance patterns, including multidrug-resistant TB (MDR-TB), pre-extensively drug-resistant TB (pre-XDR-TB), and extensively drug-resistant TB (XDR-TB), were assessed annually. Resistance to new drugs, such as bedaquiline and delamanid, was also analyzed.
Results: Among new TB cases, MDR-TB rates ranged from 55.7% to 64.6%, while in previously treated patients, rates ranged from 35.4% to 44.3%. XDR-TB rates were lower in 2022–2024 than in 2020–2021 in both groups.

Pre-XDR-TB rates among new patients decreased after 2021, while rates among previously treated patients stabilized around 50% after 2021.
Bedaquiline resistance first detected in 2021. In 2024, 76.9% of all BDQ-resistant tuberculosis cases were identified among new TB cases. Delamanid resistance emerged in 2022, with rates of 78.9% among new cases and 32.4% among previously treated cases by 2024.
Conclusions: Kazakhstan has seen a relative stabilization in DR-TB rates over the past five years. The emergence of resistance to new drugs is concerning, but improvements in diagnostics and treatment may have contributed to controlling overall resistance levels.

EP48-1165-21 Resistance patterns among treatment-naive drug-resistant people withTB in Nigeria

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Background and challenges to implementation: Nigeria bears a high burden of multidrug- and extensively drug-resistant TB (M/XDRTB). The national guidelines recommend confirmatory Line Probe Assay (LPA) for all GeneXpert-detected Rifampicin-resistant cases. This study characterizes drug resistance patterns among treatment-naive clients retested with LPA over the past three years at National TB Reference Laboratories.
Intervention or response: This is a retrospective secondary analysis of data reported for three-years (1st January 2022-31st December 2024) from nine National TB reference laboratories on Genexpert rifampicin-resistant samples. All sputum samples were subjected to first- and second-line genotypic DST using LPA GenoType® MTBDRplus assay for first line DST and GenoType® MTBDRsl® assay for 2nd-line DST respectively. Only samples with a definite and conclusive result were considered in these analyses. Simple frequencies and percentages were used to analyze the data using Microsoft Excel.
Results/Impact: A total of 3692 Genexpert rifampicin-resistant samples with clear and conclusive LPA results were analysed. Following first-line LPA, 20% (741/ 3692) of samples were susceptible to first-line drugs (i.e., discordant to baseline Xpert) while 45% (1663/ 3692) were rifampicin mono resistant, 4% (150/ 3692) had Isoniazid mono-resistance, and 31% (1138/ 3692) had MDR.
Following 2nd-line LPA, majority of the samples, 93% (3421/ 3692) were susceptible to second-line drugs (fluoroquinolones and aminoglycosides), 3% (94/3692) had fluoroquinolones mono-resistance, and 3% (105/3692) aminoglycosides mono-resistance (injectables) each, while 1% (37/ 3692) were resistant to both 2nd-line anti-TB drugs.
Conclusions: There is significant resistance to first-line and low resistance to second-line TB regimen among treatment-naive patients. Thus, it is critical to ensure 1st line genotypic DST (i.e., LPA) results are available prior to treatment initiation. Consequently, strengthening diagnostic capacities and access to genotypic DST services is still vital for effective TB control in Nigeria.

EP48-1166-21 Baseline and emergent delamanid and pretomanid resistance in people exposed to delamanid in KwaZulu-Natal, South Africa

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Background: Nitroimadazoles (delamanid and pretomanid) are increasingly used in treatment regimens for multidrug-resistant tuberculosis (MDR-TB). Clinical resistance is generally reported to involve mutations in *ddn*, *fgd1*, or *fbiA/B/C/D*.
Design/Methods: Adults at a TB referral hospital and clinics in Durban, South Africa with MDR-TB and HIV, initiating bedaquiline-based treatment, were randomised to an integrated adherence support intervention or enhanced standard care. Sputum microbiological assessments were performed at baseline, month two and month six. Positive sputum cultures from patients exposed to delamanid underwent testing for delamanid and pretomanid resistance. These included MGIT culture, whole

genome sequencing and MGIT minimum inhibitory concentrations. The critical concentrations for delamanid and pretomanid resistance were 0.06 and 0.5 µg/ml (WHO lower threshold) respectively.

Results: From 2018 to 2020, 171 participants were enrolled. 57 patients (33.3%) had a positive baseline sputum culture, of whom 24 (42.1%) were exposed to delamanid for at least two of their initial six months' treatment. Among the patients evaluated, baseline delamanid resistance was present in 6/20 (30.0%), one of whom failed treatment. Pretomanid resistance was present in 2/19 (10.5%). 8/24 (33.3%) remained culture positive at month two, with isolates from six patients undergoing MIC testing and 3/6 (50.0%) demonstrating delamanid resistance. 2/24 (8.3%) patients were culture positive at month six, both of whom had delamanid resistant infection. MIC data and variants in candidate resistance genes are shown in the table.

Patient ID	Baseline			Later timepoint			
	PMD MIC (µg/mL)	DLM MIC (µg/mL)	Mutations	Month	PMD MIC (µg/mL)	DLM MIC (µg/mL)	Mutations
P3051	-	-	fbiC 2565_ indel	6	>4.0	0.25	fbiC 990_indel
P3524	-	0.015	None	6	-	0.5	fbiC 1458_ indel, S534!
P3532	<0.25	0.06	fbiD R57L	2	<0.25	0.25	fbiD R57L
P3535	<0.25	0.03	None	2	<0.25	0.25	None
P3519	<0.25	0.125	None	2	<0.25	0.03	None
P3429	-	-	None	2	0.5	0.125	None
P3538	<0.25	0.125	fbiD R57L				
	<0.25	0.25	fbiD R57L				
P3544	<0.25	0.125	fbiC 2565_				
P3551	<0.25	0.25	indel				
P3555	1.0	0.03	fbiC V29G				
P3449*	>4.0	0.25	None				
P3554			fbiC A852V				

*Table: Patients with persistent culture positivity/ nitroimidazole resistance. Excluded fbiD A206G as presumed phylogenetic variant. *lineage 1 isolate.*

Conclusions: In this cohort of culture-positive patients initiating bedaquiline and delamanid treatment, there were high rates of nitroimidazole resistance. Delamanid resistance was more common than pretomanid resistance, but in isolation did not nescessarily to lead to poor outcomes when accompanied by combination therapy. Two cases of persistent culture positivity were associated with acquired delamanid resistance.

EP48-1167-21 The correlation between isoniazid resistance-related gene mutations and resistance levels in M. tuberculosis in Shanghai

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Background: This study analyzed INH-resistant *M. tuberculosis* isolates from Shanghai using whole-genome sequencing to characterize mutations (*katG/fabG1/inhA*) and correlate them with resistance levels. By establishing genotype-phenotype relationships, we aim to improve molecular prediction of INH resistance, supporting clinical decision-making for TB control in this low-epidemic urban setting.

Design/Methods: A total of 104 INH-resistant strains collected in Shanghai from January 2018 to December 2022 were retrospectively collected for WGS, and the correlation between phenotypic drug susceptibility testing and drug-related gene mutation was analyzed.

Table 1. Comparison of WGS Results and Phenotypic Drug Susceptibility Testing in 104 HR-MTB Strains

Gene	Nucleotide mutation	Low-level resistance (n=45)	High-level resistance (n=59)	Total isolates (n=104)	χ^2	P
ahpC	C-57T promoter	0 (0.0)	1 (1.7)	1 (1.0)	-	1.000
inhA	G-154A promoter	0 (0.0)	1 (1.7)	2 (1.9)	-	0.500
	Ser94Ala	0 (0.0)	1 (1.7)			
ahpC+inhA	G-48A promoter +G-154A promoter	0 (0.0)	1 (1.7)	1 (1.0)	-	0.452
fabG1	C-15T promoter	15 (33.3)	11 (18.6)	26 (25.0)	2.187	0.139
katG 315	Ser315Thr	15 (33.3)	30 (50.8)	55 (52.9)	4.870	0.027
	Ser315Asn	1 (2.2)	2 (3.4)			
	Ser315Ile	0 (0.0)	1 (1.7)			
	Ser315Gly	1 (2.2)	0 (0.0)			
other katG	Gly299Cys	1 (2.2)	0 (0.0)	5 (4.8)	-	0.173
	Leu387Pro	1 (2.2)	0 (0.0)			
	Asp735Ala	1 (2.2)	0 (0.0)			
	Asp419His	0 (0.0)	1 (1.7)			
	Trp191Arg	1 (2.2)	0 (0.0)			
fabG1+katG	C-15T promoter +Ser315Gly	1 (2.2)	1 (1.7)	3 (2.9)	-	0.588
	C-15T promoter +Ala130Val	1 (2.2)	0 (0.0)			
Wild-type		7 (15.6)	9 (15.3)	16 (15.4)	0.176	0.674

High-level resistance MIC > 1ug/mL; Wild type:No gene mutation site

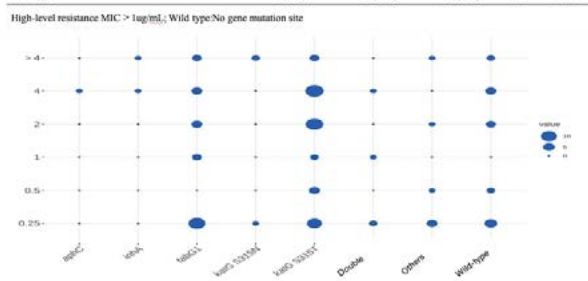

Figure 1. Scatter plot of the distribution of INH-resistance gene mutations and level of MIC

Results: Among the 104 INH-resistant strains, 88 exhibited resistance-related mutations: katG (55.8%,58 strains), fabG1 (27.9%,29 strains), wild-type (15.4%, 16 strains), inhA (2.9%,3 strains), and ahpC (1.9%,2 strain). The concordance rate between phenotypic resistance and

genotypic mutations was 84.6%. There were 16 types of mutations, 95.5% of which were single-site and 4.5% of which were combined mutations. Phenotypic drug susceptibility was low drug resistance in 45 cases and high drug resistance in 59 cases. Among 59 cases with high-level resistance, katG315 mutations were detected in 34 cases, fabG1 mutations in 11 case, and inhA mutations in 3 cases. The mutation rate of katG315 was significantly higher than that of inhA and fabG1(χ^2=4.870, P=0.027). There were 17 mutations in fabG1 among 45 patients with low level resistance. The mutation rate of fabG1 was higher than that of strains with low level resistance, but had no statistical difference.

Conclusions: FabG1 and katG315 mutations were the primary INH-resistance mutation sites in Shanghai, which corresponded to low and high-level resistance, respectively. WGS can effectively distinguish the degree of drug resistance and provide a basis for clinical decision-making. It is recommended to promote molecular diagnosis to improve the prevention and control of drug-resistant TB.

EP49 Journeys through TB: Stories of hope, resilience and recovery

EP49-1168-21 Breaking the silence: Assessing and addressing TB-related stigma in Zimbabwe

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Background: Tuberculosis (TB)-related stigma remains a significant barrier to healthcare access, treatment adherence, and social integration in Zimbabwe. This study assessed the intensity and distribution of TB stigma among people with or who had TB (PWTB), healthcare workers (HCWs), family members, and community members. The objective was to quantify stigma levels and identify key intervention areas.

Design/Methods: We conducted a cross-sectional stigma assessment with 416 PWTB, 30 HCWs, 30 family members/caregivers, and 30 community members. Stigma was measured using adapted Van Rie, Arcencio, and Corrigan scales to assess self-stigma, family secondary stigma, community stigma, and HCW stigma. Data were collected through structured interviews and analyzed using descriptive statistics to determine stigma intensity across different groups.

Results: With an overall TB stigma index of 40.9%, The findings revealed widespread TB stigma, with community stigma being the most severe—93% of respondents endorsed five or more stigma-related items. Self-stigma was also high, with 52% of PWTB reporting strong internalized stigma. Family secondary stigma was moderate, with 43% of family members endorsing at least 1–2 stigma items, and 23% experiencing high-intensity stigma. Among HCWs, 43% exhibited strong stigma, reflecting systemic challenges within healthcare settings. These findings suggest that stigma is deeply rooted in social and healthcare structures, contributing to delayed healthcare-seeking behaviours, treatment non-adherence, and emotional distress among PWTB. The high levels of community and self-stigma indicate a need for targeted psychosocial interventions, while HCW stigma underscores the importance of stigma reduction training in healthcare settings.

Conclusions: TB stigma in Zimbabwe remains a major challenge, affecting treatment outcomes and social reintegration. Addressing stigma requires community education, healthcare worker sensitization, and psychosocial support for PWTB and their families. These efforts are crucial for fostering a stigma-free healthcare environment and improving TB response strategies.

EP49-1169-21 Here is my story! TB Champions on air and unafraid

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Background and challenges to implementation: The deep-rooted stigma around Tuberculosis (TB) in India remains a significant barrier in the fight against the disease. To better understand these stigma-related challenges, The Union conducted focus group discussions (FGDs) across urban and rural Telangana (January–April 2024). The findings revealed that stigma imposes a heavy emotional burden on TB patients and hinders treatment adherence. Participants suggested that sharing real-life recovery stories could help normalize TB conversations.
But as the findings call for openness—do people truly break the silence?
Do they dare to share their stories while still navigating the battles within and around them?
Intervention or response: Building on FGD findings, conversations were initiated with individuals who had recently completed TB treatment. While many TB Champions (those who completed treatment) were open to sharing their stories in private or small groups, most remained hesitant to speak publicly due to persistent fear and stigma. Six courageous TB Champions stepped forward as torchbearers to share their personal journeys on Charminar Community Radio in Hyderabad. These six in-depth, interactive stories aired 12 times between 16th and 22nd November 2024. Each broadcast featured a conversation with the radio jockey, exploring the Champion's experience with TB, their path to recovery, and their present state of health—helping humanize the disease and offer hope to others in silence.

Results/Impact: Post FGD revealed that radio campaign successfully reached a wide audience across Hyderabad, sparking meaningful community-level conversations around TB. Listeners expressed a deeper understanding and empathy toward TB Champions, with many appreciating their courage to speak out. The storytelling format humanized the disease and played a pivotal role in reducing the stigma attached to TB.
Conclusions: These six powerful stories ignited a movement — now, across the state, more TB Champions are stepping forward to share their journeys on various platforms including radio, social media, and community events.

EP49-1170-21 Enhancing TB knowledge and reducing stigma among private healthcare providers through virtual learning platforms in Lagos, Nigeria

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Background and challenges to implementation: The link between TB stigma and ignorance is well-established; fueling the TB epidemic in Nigeria, which ranks sixth among high-TB-burden countries globally. Among private healthcare providers (PHPs), outdated knowledge on TB treatment and prevention, misconceptions about patient isolation, and fears of income-loss contribute to stigmatizing practices and limited capacity to deliver TB care. Reinforcing knowledge and addressing stigma are crucial to achieving the End-TB Goal. However, conventional training methods are often expensive, time-consuming, and particularly difficult for PHPs (including Patent Medicine vendors, maternity homes, standalone labs, private clinics) who cannot afford prolonged absences from their practices.
Intervention or response: To bridge this gap, Loving Gaze (LG), as the intermediary organization (IO) for the USAID-funded SHOPS Plus and TB-LON3 projects, strengthened private TB networks using virtual learning platforms from 2020-2024 through 26 geographically and peer-based chatgroup forums, 24 quarterly network meetings, bi-annual webinars, alongside weekly supportive supervision visits to PHP sites. These platforms facilitated continuous learning, identification of challenges, devel-

opment of responsive strategies, and exchange of best practices in systematic TB screening, prompt diagnosis, treatment, prevention, patient counseling and follow-up. The LG Programme Manager coordinated these activities of the virtual platforms providing online supervisory and mentoring support.

Results/Impact: Through these virtual platforms, the capacity of 2681 PHPs was strengthened. TB case notifications increased from 22 cases in July 2018 (with no childhood TB) to a cumulative total of 23,000 cases—including 1,370 childhood TB cases—by January 2025. These outcomes indicate stigma reduction, improved PHP knowledge and performance in TB service delivery in Lagos. PHPs have continued to promote and sustain TB programming despite limited from external donor-funded projects.

Conclusions: Integrating virtual platforms with traditional training approaches effectively bridges knowledge gaps and reduces stigma among PHPs. This holds promise for replication in Nigeria's journey to end TB, in light of donor-fatigue and limited resources.

EP49-1171-21 Assessing TB prevention in university freshmen: An IMB model-based survey on knowledge, motivation, behavioural skills, stigma, and information channels

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Background: Tuberculosis (TB) remains a significant public health challenge in China, with medical students representing a critical population for TB control due to their dual roles as future healthcare providers and health communicators. Despite national efforts to integrate TB education into medical curricula, gaps persist in students' knowledge, prevention behaviors, and attitudes toward TB patients. This study applies the Information-Motivation-Behavioral Skills (IMB) model to systematically assess TB prevention determinants among medical freshmen in China, aiming to inform targeted educational strategies aligned with China's TB elimination goals.

Design/Methods: A cross-sectional survey was conducted in a medical university, enrolling 3,479 freshmen. Validated questionnaires measured TB core knowledge (transmission, symptoms), general knowledge, prevention motivation, self-reported behavioral skills, TB-related stigma, and information-seeking preferences. Data were collected via an online platform, with statistical analyses performed using SPSS 26.0.

Results: This study demonstrates that the overall TB core knowledge awareness rate among medical freshmen was 86.3%, surpassing the 85% target set by the National Tuberculosis Control Plan (2019–2022). The lowest awareness (35.9%) pertained to „TB treatment typically requiring six months", highlighting insufficient emphasis on treatment duration and adherence in current health education programs. Although 63.5% reported high prevention motivation, merely 8.9% think it is very likely to be infected with tuberculosis. Stigmatizing attitudes were prevalent (63.5%). 29.3% reported feeling uncomfortable living with classmates who have a history of tuberculosis infection. School curriculum dominated as a preferred information source (87.1%).

Conclusions: This study identifies actionable gaps in TB preparedness among Chinese medical freshmen, advocating for curriculum-integrated education to address knowledge deficiencies and peer-led anti-stigma initiatives. The strong preference for institutionally vetted information underscores universities' pivotal role in health communication. Prioritizing IMB-based interventions could enhance both personal prevention practices and future professional competency, directly supporting China's national TB control agenda.

EP49-1172-21 Documenting rights violations associated with TB in Nigeria: Impact on community rights and gender

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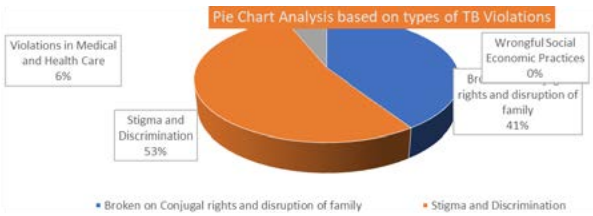
Background and challenges to implementation: Tuberculosis (TB) continues to pose a significant public health challenge where the disease is deeply intertwined with rights violations. People affected by TB (PATBs) often faces a barriers, including stigma, discrimination, and restricted access to essential healthcare services. These barriers further impact TB prevention and treatment efforts. Data on TB-related rights violations have been scarce, leaving a critical gap in addressing the systemic inequalities faced by PATBs. Lawyers Alert (LA) began to document and analyze rights violations associated with TB, with the aim of advancing CRG TB interventions.

Intervention or response: This intervention aimed to empower communities to systematically document rights violations experienced by PATBs and use this evidence to advocate for policy and programmatic reforms.LA deployed a community-led monitoring approach that placed PATBs at the forefront of the data collection process. Through strategic partnerships with civil society and Nigeria's National Tuberculosis Program (NTBLCP), rights violations were documented using Lawyers Alert's

online tool, "LadockT," which allows for real-time analysis of qualitative data. The findings aids advocacy actions aimed at promoting a rights-based and equitable TB response.

Results/Impact: The intervention strengthened the capacity of TB-affected communities to document rights violations. Through community-led documentation efforts, a grassroots movement began to emerge, fostering collective action towards advocacy for TB rights. The results of the documentation provides a scientific data for advocacy. The report revealed a landscape of rights violations, were stigma and discrimination were the most prevalent constituting 53% of the documented violations. Breaches of confidentiality and discriminatory practices in healthcare, accounted for 6% underscoring the need for targeted interventions in these areas.



Conclusions: The results of this intervention highlight the urgent need to address human rights violations as an integral part of TB control efforts in Nigeria. The findings call for comprehensive reforms, including the integration of rights based approaches into TB programming.

EP49-1173-21 Leveraging community-led monitoring to identify and address stigma and discrimination through the iMonitor ATM+ system in Kenya

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Background and challenges to implementation: Community rights and gender assessment study in Kenya found stigma, experienced by up to 8% of people living with tuberculosis, hinders access to diagnosis and treatment contributing to social isolation, psychological distress and poor health outcomes across various Kenyan counties. Community Led Monitoring (CLM) provides platform for service users to share feedback on their experiences. Supported by Global Fund, Amref, in collaboration with the Kenya Red Cross Society (KRCS) , implemented CLM to identify human rights issues and empower communities with information for action.

Intervention or response: From July 2022 to December 2024, the project implemented CLM across 47 counties, with KRCS leading human rights and gender, and Amref CLM interventions. Communities used iMonitor+ platform to provide real time feedback on their experiences. Duty bearers and paralegals responded to issues raised. This paper focuses on experiences on Discrimination/ Stigmatization among People Living with HIV (PLHIV) and TB service users.

Results/Impact: A total of 4,520 issues on human rights violation were reported across 38 counties, with Discrimination/Stigmatization at 799 issues (18%). Among issues reported, 188 (24%) were by PLHIV and 53 (7%) by TB service users. The issues were verbal abuse, social isolation, forced disclosure of HIV status, denial of services and physical assault. Perpetrators were family members (PLHIV: 43, TB: 17), neighbors (PLHIV: 39, TB: 8), and healthcare providers (PLHIV: 33, TB: 9). In response to reported issues, various actions were taken: 55% received legal advice and counselling, 13% health facility-based resolution, 11% mediation services, and 21% used alternative dispute resolution mechanisms. These findings informed programming, including national surveys and Breaking Down Barriers initiative by Global Fund.

Conclusions: CLM has been critical in bringing key human rights issues to light and ensuring action is taken. Strengthening CLM is essential for providing sustained platform for feedback and advocacy, helping reduce stigma and improve outcomes for service users.

EP49-1174-21 Feasibility and impact of behaviour change solutions for TB response among vulnerable populations: Insights from 'Breaking the Barriers' community engagement project (A NIMHANS-led study)

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Background: The Breaking the Barriers (BTB) project developed nine behavior change solutions (BCS) to improve TB case finding and treatment adherence among vulnerable communities in Assam, Bihar, Karnataka, and Telangana. Three case finding solutions—TB Jaanch Coupon, Health Auto, and TB Soochana—and six case holding solutions—TB Starter Kit, TB Buddy, TB Champion Health Workers, Phone a Friend, Sharing Circles, and TB Treatment Completion Certificate—were implemented.

This study aimed to evaluate the impact of these solutions on TB awareness, notification, and treatment adherence, and to assess their feasibility for implementation.
Design/Methods: Implemented across 16 districts from October 2021 to December 2023, one case finding and one case holding solution were piloted per Tuberculosis Unit. Using a phenomenological qualitative approach and in collaboration with National Institute of Mental Health and Neuro Sciences (NIMHANS), data were collected through 195 in-depth interviews and 11 focus group discussions with people with TB, caregivers, National Tuberculosis Elimination Programme staff, and community stakeholders from May–August 2023.
Results: Three case finding solutions—TB Jaanch Coupon, Health Auto, and TB Soochana—effectively addressed delays in diagnosis and improved health-seeking behaviour. Six case holding solutions—TB Starter Kit, TB Buddy, TB Champion Health Workers, Phone a Friend, Sharing Circles, and Treatment Completion Certificate—supported treatment adherence, reduced confusion, and offered emotional support. Health Auto, though useful, was resource-intensive and raised concerns about sustainability. While not all solutions equally addressed stigma, four— TB Champion Health Workers, Jaanch Coupon, Starter Kit, and Treatment Completion Certificate—demonstrated a measurable impact on stigma reduction.
Conclusions: The BCS interventions proved feasible, enhancing diagnosis and adherence through culturally resonant, community-integrated strategies. TB Survivor-driven engagement and stigma reduction emerged as critical, suggesting scalable, multifaceted approaches to optimize TB care in diverse settings.

EP49-1175-21 "You will never be the same": A photovoice study with TB survivors in Uganda

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Background: About 80,000 people with Tuberculosis (TB) complete treatment in Uganda annually, adding to the growing population of TB survivors. While the idea of involving 'TB Champions' is popular, current approaches remain largely limited to task-shifting within health facilities. We engaged TB survivors in Central Uganda to express their experiences and views on their meaningful engagement in the TB response using a participatory photography process.
Design/Methods: Fifteen TB survivors (8 men, 7 women), who had completed treatment at Naguru and Kawolo hospitals between February 2022 and August 2024, were trained in ethical photography using digital cameras. They took photos over two weeks and discussed their favourite images and agreed messages in workshops. We analysed photos and audio transcripts from the workshops using thematic analysis.
Results: Many TB survivors were 'unofficial' TB advocates out of compassion and worries about TB exposure due to poverty, poor housing and sanitation, and lack of awareness in their communities. TB survivors changed their lives to protect themselves and prevent re-infection. Women counselled fellow women and persuaded neighbours and friends with cough to test for TB. Men helped with transport to health facilities and encouraged fellow men to reduce alcohol use. Most TB survivors struggled with incomplete physical recovery, experiencing chest pain, breathlessness, and body weakness due to TB-related lung damage; loss or change of work; and social isolation, all of which impacted their mental well-being. TB survivors recommended health education after TB cure as fear, pain, and stress limited learning during treatment to be able to address TB myths and knowledge gaps effectively. They also need public speaking training and empowerment to gain courage to counter TB stigma.

Figure 1 "*Like the parasite that damaged this avocado tree, TB has left scars on us. You will never be the same.*" TB survivor (female), Kawolo, Uganda.

Conclusions: TB policymakers and programmes should listen to and respond to challenges of TB survivors, building their capacity to ensure the TB response is effective and holistic.

EP49-1176-21 Indigenising TB professional development and education through researcher continuity and storytelling: Lessons from Inuit community public health worker training in Nunavik (Quebec, Canada)

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Background and challenges to implementation: Nunavik is home to a thriving Inuit population, Nunavimmiut. Nunavimmiut strongly desire adequate and effective health services yet experience high tuberculosis (TB) incidence and hardships associated with TB care. Hardships are rooted in inadequate medical resourcing, and in cultural and linguistic gaps between services and communities served. A novel community public health worker (Public Health Officer, PHO) program was recently developed to address hardships by strengthening cultural safety, Inuktitut language, and Nunavimmiut-workforce representation within care settings. PHO training poses several challenges including diverse professional and educational backgrounds and a paucity of Nunavik-specific learning resources.
Intervention or response: Indigenous researchers and researchers with lived experience in Nunavik developed a PHO Resource Manual based on Nunavimmiut TB care experiences collected through community-based participatory research. This team of researchers piloted a training curriculum in Nunavik in 2025.
Results/Impact: We developed a versatile training template, emphasizing person-centred support as an integral component of TB treatment and drawing on Indigenous learning methodologies. The training template identified three requisite areas: Knowledge (foundational TB knowledge), Communication Techniques (communicating knowledge to patients), and Resources (accessing available resources, PHO Resource Manual) (Figure 1a). Facilitators honoured Nunavimmiut storytelling tradition as an approach to explore the complexity of TB pathology and Nunavimmiut patient experience (Figure 1b). Storytelling additionally scaffolded learning through scenario-based and observational learning. Participants responded positively on the feedback questionnaire, expressing a desire for future trainings and improved connectedness to their role. Participants supported the development of additional Inuktitut and Inuit-led resources.

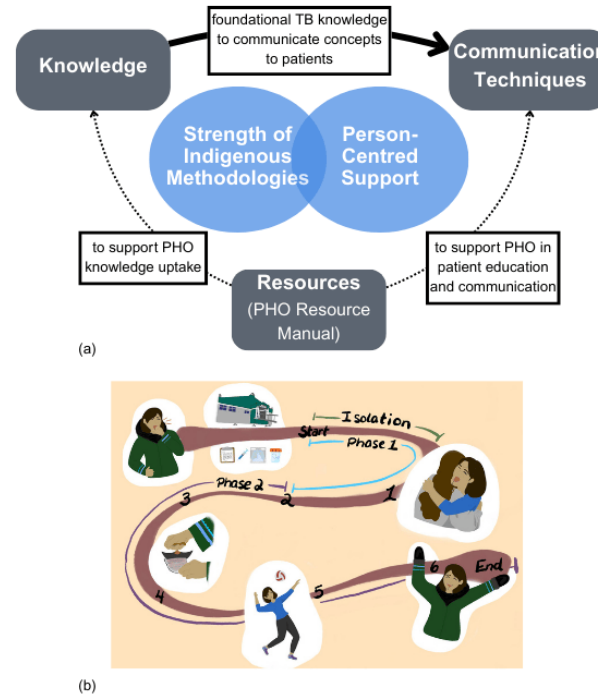

Figure 1. (a) Training template and (b) sample of PHO Resource Manual incorporating storytelling as an Indigenous learning methodology.

Conclusions: Community-based participatory research and researcher continuity throughout the project led to the design of Nunavik-specific resources. The training received positive participant feedback, yet researchers recognize the importance of maintaining ongoing relationships with PHOs to inform future programming. This training template and approach, including researcher, community, and PHO co-creation, inform future trainings in TB, other public health topics, and diverse setting PHO-programs.

EP50 Sick because they are poor: Undernutrition poverty and the TB crisis

EP50-1177-21 Placing a nutritional lens on paediatric TB risk: Variability in definitions and their association with TB

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Background: Sub-optimal nutrition in children encompasses a range of biological states including severe acute malnutrition, stunting, micronutrient deficiencies, and overweight and obesity. Pediatric TB research lacks standardized definitions of sub-optimal nutrition, leading to inconsistencies in understanding related associations with TB disease. We assess how various definitions of sub-optimal nutrition impact variability in reported associations with pediatric TB disease.
Design/Methods: Through a literature review, we assessed variability in sub-optimal nutrition definitions across pediatric TB studies. Subsequently, we used data from a large TB screening program in Karachi and Peshawar, Pakistan (2018-2021) for assessment. Of children diagnosed with all forms of TB, child household contacts (HHC) 0-14 years old were enumerated and screened for TB. Among child HHCs we calculated a variety of sub-optimal nutrition measures based on those reported most frequently in existing pediatric TB literature. Accounting for household clustering, we conducted logistic regression analyses assessing the association of the varying sub-optimal nutrition measures with TB disease prevalence.

Term	Definition	Frequency in child HHCs diagnosed with TB (N=499)	Frequency in child HHCs not diagnosed with TB (N=12,506)	p-value comparing the frequency with and without TB	Association with Prevalent TB in child HHCs, OR (95% CI)
Weight-for-Age Z-score (WAZ) ≤-2	Moderate underweight	153 (30.7%)	2813 (22.4%)	<0.001	1.60 (1.31-1.99)
Weight-for-Age Z-score (WAZ) ≤-3	Severe underweight	69 (13.8%)	1096 (8.7%)	<0.001	1.71 (1.29-2.25)
Height-for-Age Z-score (HAZ) ≤-2	Moderate stunting	274 (55.0%)	6295 (50.3%)	0.034	1.20 (0.99-1.46)
Height-for-Age Z-score (HAZ) ≤-3	Severe stunting	191 (38.3%)	4288 (34.2%)	0.057	1.22 (0.99-1.52)
BMI-for-Age Z-score (BAZ) ≤-2	Thinness	81 (16.0%)	1982 (15.8%)	0.818	0.96 (0.74-1.25)
BMI-for-Age Z-score (BAZ) ≤-3	Severe thinness	35 (7.0%)	937 (7.4%)	0.785	0.92 (0.64-1.34)
Weight-for-Height Z-score (WHZ) ≤-3	Severe wasting	7 (4.6%) [out of 153]	183 (4.3%) [out of 4164]	1.00	1.06 (0.48-2.34)
Weight-for-age below 5th percentile	Low weight-for-age	233 (46.7%)	4079 (32.6%)	<0.001	1.80 (1.47-2.21)
Weight-for-age below 3rd percentile	Very low weight-for-age	269 (52.1%)	4965 (39.7%)	<0.001	1.82 (1.48-2.23)

Conclusions: Different sub-optimal nutrition measures in children led to varying associations with prevalent TB in child HHCs, with WAZ having the strongest association, followed by HAZ.
It is essential to understand how different markers of sub-optimal nutrition may impact TB disease in this vulnerable population. New pediatric guidelines should consider addressing this critical area.

EP50-1178-21 High prevalence of TB among Malawian children aged <5 years hospitalised with severe acute malnutrition

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Background: Children with severe acute malnutrition (SAM) are at high risk for tuberculosis (TB), but precise estimates of TB prevalence and accurate TB diagnosis in this population remain elusive. The objectives were to define TB prevalence in children hospitalized with SAM and to explore clinical factors associated with TB diagnosis.
Design/Methods: This was a consolidation of two prospective observational studies of children 6 to 59 months admitted to Kamuzu Central Hospital (Lilongwe, Malawi) with SAM. All enrolled children underwent assessment for TB-associated signs and symptoms, chest x-ray (CXR), HIV infection, and Xpert MTB/RIF Ultra on gastric aspirate specimens. Children were followed until hospital discharge. CXRs were independently interpreted by at least two reviewers.
Absolute numbers and proportions of abnormal findings were reported. Children were defined as having 'unlikely,' 'unconfirmed,' and 'confirmed' TB based upon consensus research definitions for TB in children.
Results: From November 2021 to May 2022 and February 2023 to January 2024, 341 children with SAM were enrolled. Their mean age was 20 months (standard deviation: 12 months), 29% had kwashiorkor, 9% were living with HIV, and 4% were HIV exposed. In-hospital mortality was 8%. CXRs were available and of adequate quality for remote review from 261 (77%) children.
Of these, 39% were abnormal and 19% had findings suggestive of TB. TB prevalence in this cohort was estimated at 19% (95% confidence interval: 15- 24%) based upon 59

(17%) having unconfirmed TB and 6 (2%) having confirmed TB. Upcoming analyses will evaluate clinical differences amongst those diagnosed with TB or not.
Conclusions: These results highlight the large burden of TB in children hospitalized with SAM in this setting and the need to prioritize intensive case finding efforts in this high-risk group. Results suggest challenges with microbiologic confirmation in this population, and under-diagnosis of TB in this setting for this population.

EP50-1179-21 Poor nutrition increases the mortality risk in children treated for TB in sub-Saharan Africa

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Background: Poor nutrition weakens the immune system, compromising treatment response and increasing mortality among people with tuberculosis. The impact of nutritional status on tuberculosis outcomes remains insufficiently characterized in many high-burden settings and populations. Hence, we evaluated the relationship between nutritional status and TB treatment outcomes in individuals treated for tuberculosis.
Design/Methods: We conducted a cohort study among individuals receiving tuberculosis treatment in Eswatini, Mozambique, and Tanzania from October 2020 to June 2023. Nutritional status was expressed as body mass index (BMI) for adults and adolescents (age ≥10 years) and weight-for-age Z-score for participants under 10 years. Participants were followed until the end of treatment.
Results: Among 433 participants, 48.3% were female, 40.6% were children <10 years of age, and 43% were living with HIV. Nearly half (49.0%) had normal weight at the start of treatment, while 42.7% were underweight, and 8.3% were overweight or obese. Thirty participants (7.6%) died after TB treatment initiation, with 16 deaths occurring among children (9.1%). In multivariate-adjusted logistic regression, underweight status was associated with a four-fold increased risk of mortality among children (OR 4.35, 95% CI [1.2-21.9]). No significant association was found between being underweight and mortality in adults. Among underweight children, 43.9% (40/91) improved their weight by 5% or more two weeks after starting tuberculosis treatment. Weight change was not associated with TB outcome.
Conclusions: Our findings highlight the considerable impact of poor nutrition on mortality among children. The elevated mortality risk among underweight children argues for detailed nutritional screening and early nutritional support as part of routine tuberculosis care. In addition, children with malnutrition should routinely be screened for tuberculosis. Integrating nutritional interventions into tuberculosis programs could reduce mortality and improve treatment success. Further research is needed to evaluate targeted nutritional interventions for reducing tuberculosis mortality among children.

EP50-1180-21 Rifampin dosing and exposure in undernourished people with TB in India

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Background: Undernutrition is associated with more severe tuberculosis and unfavorable treatment outcomes. Undernourished persons with tuberculosis (PWTB) may receive inadequate drug doses due to low body weight. Low doses may impact drug exposure, thereby impeding faster bacteriological clearance. Rifampin plays a crucial role in smear conversion, and we assessed dosing and pharmacokinetic target attainment in undernourished PWTB.
Design/Methods: This study recruited adults with or without undernutrition (body mass index, BMI < 18.5 kg/m^2), diagnosed with drug-sensitive TB. A pharmacokinetic visit was conducted at least two weeks after treatment initiation to quantify anti-TB drug concentrations using validated mass spectrometry methods. Sampling

was conducted at pre-dose and at 2-, 4-, 6-, and 8-hour post-dose. Population modeling and simulations were performed using a nonlinear mixed-effects modeling approach in Phoenix WinNonlin to determine doses for optimal rifampin exposure.
Results: A total of 127 participants completed their pharmacokinetic visit, with 36% having a BMI below 18.5 kg/ m^2. 72% of undernourished PWTB received a dose of 450 mg, and 72% of participants with a BMI greater than 18.5 kg/ m^2 (control group) received a dose of 600 mg or higher. Only 30% of undernourished PWTB attained a target rifampin maximum concentration (C_{max}) of 8 mg/L versus 46% in the control group. Data were fit in a one-compartment model. Simulated doses of 600 mg and 900 mg in undernourished PWTB improved the C_{max} target attainment to 51% and 71%, respectively. A simulated 900 mg dose in all participants improved overall target attainment to 75%.
Conclusions: A lower number of undernourished PWTB reached the rifampin target exposure. A flat 600 mg dose might moderately benefit undernourished PWTB in achieving the C_{max} target. However, all participants, regardless of their nutritional status, may benefit from a higher dose of rifampin.

EP50-1181-21 Improving the diagnosis of TB among children with malnutrition in Niger, Nigeria and South Sudan

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Background: Tuberculosis (TB) and malnutrition are a deadly combination. We assessed frequency of TB diagnosis and reasons for TB treatment in children with severe acute malnutrition (SAM) in therapeutic feeding centres using new WHO-recommended treatment decision algorithms (TDA).
Design/Methods: Prospective diagnostic study conducted in three therapeutic feeding centres in Niger, Nigeria, and South Sudan. Children with SAM and at least one additional sign or symptom suggestive of TB were included. Xpert MTB/RIF was available at all sites. Chest X-ray was available in Niger and Nigeria. However, not all children with presumptive TB accessed chest X-ray due to logistical constraints. Children with TB were followed for 2 months.
Results: Among 1157 children included, median age was 1.3 years (IQR: 0.8-2.0), 519 (44.9%) were female, and 20 (1.7%) living with HIV (CLWHIV). Most children (1129, 97.6%) were hospitalized. Xpert MTB/RIF was performed in 1137 (98.3%) and was positive in 36 (3.2%). Chest X-ray was performed in 510 (44.4%) children and was suggestive of TB in 33 (6.5%). TB treatment was initiated in 265 (22.9%) children, 140 (52.8%) within three days of first assessment.
The principal reason in the TDA cascade to initiate treatment was clinical features score for 134 (50.6%), clinical-radiological score for 53 (20.0%), contact with person with TB for 31 (11.7%), Xpert MTB/RIF result for 24 (9.1%) and TB-LAM result for 3 (1.1%). Most of the children who started TB treatment (98%) improved clinically at 2-month.
Conclusions: A high proportion of children with SAM were diagnosed with TB in nutritional centers using the new treatment decision algorithms. Xpert MTB/RIF positive rate was low, as expected, however, it remains an important adjunctive diagnostic tool and aids detection of TB resistance. Chest X-ray was a useful tool for diagnosis, where available. TB diagnosis was primarily based on clinical features or history of contact person with TB.

EP50-1183-21 Carbohydrate dominance and gender inequity in diets of TB-affected households in India

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Background: Over half of TB cases in India are attributable to undernutrition, and nutritional support for household contacts (HHCs) of persons with TB can reduce progression to active disease. However, there is no clear

consensus on the ideal composition of food baskets. Understanding what HHCs eat—and don't eat—can guide the design of more effective and equitable interventions.

Design/Methods: We enrolled 285 HHCs of adults with microbiologically confirmed TB in Puducherry and Tamil Nadu, India as part of the TB LION (Learning Impact of Nutrition) study. Baseline dietary intake was assessed via 24-hour recall. Macronutrient composition and dietary diversity were calculated using a modified Women's Dietary Diversity Score (WDDS), with consumption of ≥5 of 10 food groups considered "diverse."

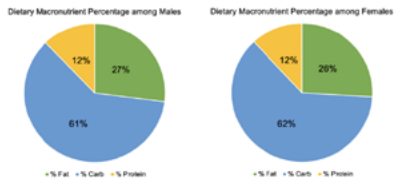
Food security was measured using the Household Food Insecurity Access Scale (HFIAS); participants with a score of 0 were categorized as food secure. Analyses were stratified by sex, BMI, and food security status.

Results: Diets were predominantly carbohydrate-based (62% of energy), with low contributions from fat (26%) and protein (12%) (Fig. 1A). Women (n=180) consumed significantly fewer calories across all macronutrients than men (n=105) but reported higher intake of dark leafy greens and fruits—though these were a small component of their diets (Fig. 1B).

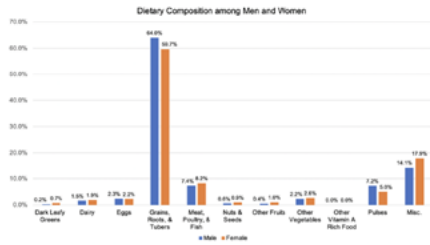
Food insecurity was more prevalent among undernourished (n=86) vs. well-nourished HHCs (n=199) (26% vs. 17%). Among food insecure individuals, 94% had low dietary diversity (<5 food groups), compared to 79% of food secure individuals.

Figure 1. Macronutrient (Panel A) and Dietary Composition (Panel B) among HHC by Sex and BMI status

Panel A.



Panel B.



Conclusions: This cohort's diet reflects a triple concern: gendered nutritional inequity, low diversity, and poor dietary quality despite perceived food security. Interventions must address macronutrient imbalance, incorporate regionally appropriate counseling, and ensure women are not nutritionally disadvantaged. Increased focus on dietary diversity is also critical since micronutrient deficiencies are associated with increased TB progression. These insights can help optimize basket design.

EP50-1184-21 Food with medicines: Impact of nutritional support on nutritional status, body composition, and grip strength in people nested within the RATIONS trial

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Background: Information on the effect of nutritional support on body-composition and grip-strength in patients with tuberculosis (PwTB) is sparse. We assessed nutritional status [body mass index (BMI)], body composition (lean body mass, body fat) with bioelectrical impedance analysis (BIA), and handgrip strength in PwTB at enrolment and after 6 months of nutritional support.

Design/Methods: The 2800 PwTB in the RATIONS trial received a monthly food-basket providing 1200 Kcal and 52 gm protein daily during the 6-month treatment period. We enrolled 100 PwTB, of which 97 completed endline measurements. We conducted their weight (SECA 803), height (SECA 213 stadiometer), BIA (Bodystat® Quadscan 4000), and handgrip strength (JAMAR hand dynamometer) at baseline and the end of intervention. We used non-parametric tests with Bonferroni correction for multiple comparisons, with a p-value <0.005 considered statistically significant.

Results: The median (interquartile range) of weights and BMI at baseline in 65 men were 41.6 kg (39.0, 45.4) and 16.0 kg/m² (14.8, 17.7); the same in 32 women were 34.4 kg (31.9, 6.5) and 15.7 kg/m² (14.5,17.7) respectively. Over 80% were underweight (BMI <18.5 kg/m2), and > 50% had BMI <16.0 kg/m² (severely underweight) at baseline. Medians of lean body mass increased from 26.3 kg to 33.3 kg and of grip-strength from 23.7 kg to 28.5 kg. The fat mass reduced from 32.6 kg to 26.3 kg. The correlation coefficient of gain of lean mass with weight was 0.9342. 57% of patients continued to be underweight after 6 months.

Indicator	PwTB (n=97)	PwTB at 6 months (n=97)	Change over the intervention period	P values*
Body mass index, kg/m²	15.9 (14.6, 17.7)	18.1 (16.5, 19.2)	1.5 (0.8, 2.6)	<0.00005
Body weight, kg	39.6 (34.4, 43.6)	44.0 (39.6, 48.6)	4.2 (1.9,6.5)	<0.00005
Fat mass, kg	13.1 (11.1, 15.3)	12.2 (10.0, 14.2)	-0.80 (-2.10,0.4)	<0.00005
Lean body mass, kg	26.3 (21, 32.4)	33.3 (25.9, 37.8)	4.80 (2.4,7.4)	<0.00005
Fat mass (% of body wt.)	32.6 (25.3, 41.7)	26.3 (21.8, 35.0)	-6.4 (-15.6,3.0)	<0.00005
Lean mass (% of body wt.)	67.4 (58.3,74.7)	73.7 (65.0,78.2)	3.7 (1.2,9.40)	<0.00005
Fat-free mass index, kg/m²	11.1 (8.7,12.7)	12.9 (11.1,15.0)	1.8 (0.9,2.9)	<0.00005
Hand-grip strength, kg	23.7 (19.3,30.3)	28.5 (21.85,35.10)	3.9 (0.6,6.9)	<0.00005
Phase angle (degrees)	5.2 (4.3,5.6)	5.4 (4.8,6.0)	0.3 (-0.2,0.9)	<0.00005

**Wilcoxon signed rank test with p values adjusted for multiple comparisons.*

Conclusions: In a setting with high prevalence and severity of undernutrition, nutritional support in PwTB led to clinically significant improvements in nutritional status, body-composition and grip-strength without any increase in fat mass, aiding nutritional and functional recovery. The nutritional support needs to be graded in quantity and duration for optimal effect.

EP50-1185-21 Beyond the diagnosis: Using social determinants to drive targeted TB interventions in South Africa's West Rand District

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Background: While South Africa has made significant progress in scaling up TB diagnosis and treatment, social and structural determinants continue to undermine health equity and patient outcomes. This study investigates the non-clinical realities shaping TB vulnerability, access, and recovery in the West Rand District, with the goal of guiding programmatic action that addresses root causes.
Design/Methods: A cross-sectional survey was administered to 75 TB patients across three sub-districts . The questionnaire included 43 items covering socio-demographics, housing, food insecurity, healthcare access, digital access, and TB treatment experiences. Descriptive analysis was conducted to map trends in social vulnerability and service engagement.
Results: Most participants were male (68%) and aged 25–54 (66%). Unemployment was high (56%), with 60% earning less than R3,000/month. Nearly half lived in overcrowded or informal dwellings, and 28% reported food insecurity. Despite full reliance on public facilities and strong access to TB diagnosis and treatment (>80%), deeper vulnerabilities persisted 22% were orphans, 100% uninsured, and few had access to digital health support. High adherence (95%) and first-line drug usage (97%) were observed, yet structural inequities—such as low education levels and unstable employment—were prevalent and linked to social exclusion.
Conclusions: Findings from this assessment have directly informed the implementation of a localized **Social Determinants of Health Core Package of Interventions**, currently being rolled out in all facilities in West Rand. This package includes nutrition support, social grant referrals, psychosocial support, and tailored patient education. These actions reflect a shift from biomedical-only models to an integrated, equity-driven TB response. The study underscores the importance of routinely assessing and responding to social vulnerabilities as part of national and sub-national TB programming.

EP50-1186-21 Eureka: Evidence of links between financial help and TB disease and recovery in Victoria, Australia

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Background: Globally it is well recognised that there is an association between TB and financial wellbeing. Australia is generally considered to be a country with "high income, low TB incidence" yet health inequities are observed.
In Victoria, Australia, specific, limited financial assistance for people affected by TB is available on an *ad hoc* basis, with help provided in response to assessed need. However, there has been limited evaluation of this support and clinical or public health outcomes.
Design/Methods: Adopting a data mining approach, routinely collected programmatic data was analysed. Using R, queries were made exploring the possibility of associations between the receipt of TB specific financial assistance across the TB cascade of care. Using data collected from January 2015 to December 2023, inclusive, analysis considered treatment interruption, local transmission, and linkage to care alongside demographic and TB clinical characteristics. A total of 3811 eligible TB notifications were included.
Results: Compared with the broader cohort of people eligible for anti-TB treatment those receiving TB-specific financial assistance were found to have longer treatment periods by 47 days, suggestive of brief treatment interruptions. Further, treatment interruption of two or more months were 6.3 times more likely and incomplete treatment was 2.1 times more likely. Delays in linkage to care and treatment commencement were less likely for those receiving TB-specific financial assistance. There is evidence of a connection between local TB transmission and receipt of TB-specific financial assistance with those receiving financial aid twice as likely to host *M.tb* that clustered at less than 6 SNP on whole genome sequencing.
Conclusions: Provision of directed financial assistance in our context shows evidence of association with important clinical and public health outcomes, potentially remediable with optimal support. These findings highlight the need for improved evaluation of financial burden associated with TB, even in high income settings.

EP51 Finding those missing: Responding to differentiated screening need

EP51-1187-21 Accelerating drug-resistant diagnosis and ending the gap of missing cases in urban India

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Background and challenges to implementation: Tuberculosis (TB) remains a major public health challenge in India, accounting for more than one-fourth of global burden. Drug-resistant TB (DR-TB) amplifies this burden, particularly in urban areas with systemic gaps in universal drug susceptibility testing (U-DST), leading to missed diagnoses and delayed treatment.
Project STRIDE (Strengthen U-DST for Increasing DR-TB Diagnosis and Ending gap of missing DR-TB patients), implemented in collaboration with India's National TB Elimination Programme (NTEP), aimed to strengthen DR-TB care pathways by addressing diagnostic bottlenecks, reducing treatment delays, and building sustainable models for replication in other high-burden settings.
Intervention or response: The project employed NTEP's four-pillar framework—'Detect-Treat-Prevent-Build'—to address gaps in DR-TB care. U-DST coverage was expanded (Detect) from 8 to all 30 Urban Primary Health Centres (UPHCs) in Agra by strengthening on-site sample collection and deploying sample transport coordinators to ensure timely delivery to testing labs. Partnerships with private laboratories addressed diagnostic backlogs and accelerated result turnaround times.
Pre-treatment evaluations (PTEs) were streamlined (Treat) to reduce delays in treatment initiation. This included ensuring comprehensive assessments to rule out underlying conditions at baseline.
Preventive measures (Prevent) included patient counselling on treatment and infection control. Capacity-building efforts (Build) focused on sensitizing UPHC staff and strengthening data reporting to NTEP.
Results/Impact: The project achieved 100% U-DST coverage across 30 UPHCs, collecting 8,224 samples between Jan-Dec-2024 (Figure-1).
Same-day sample transport increased from 73% to 98%. Diagnostic turnaround times were significantly reduced through private lab partnerships.
Approximately 1,000 TB cases were diagnosed, including 100 DR-TB cases (~10% positivity). Nearly 94% were initiated on treatment and PTE delays reduced from seven days to two days.

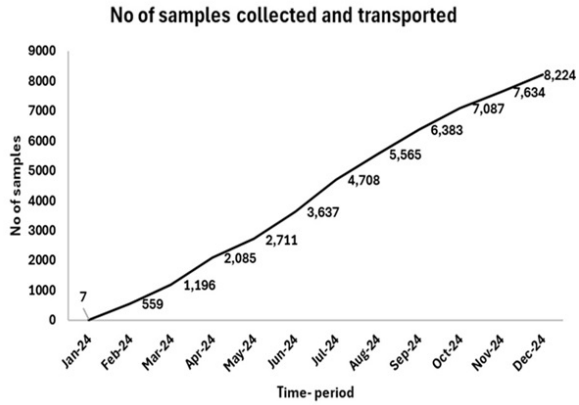

Figure 1. Trends in DR-TB sample collection and transportation (cumulative): Project STRIDE, Agra, India 2024.

Conclusions: Project demonstrates that decentralizing diagnostic services and optimizing sample transport can improve DR-TB detection and treatment linkages in urban settings. Prioritizing resources for transport systems and streamlining PTE are key to achieve India's TB elimination targets.

EP51-1188-21 Active TB detection in nomadic populations: Insights from hard-to-reach communities of Adamawa State, Northeast Nigeria

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Background and challenges to implementation: Nigeria missed 25% of the estimated people with TB 2024, mostly among key and vulnerable populations, such as nomads. Adamawa State has an estimated 450,000 nomads who are known to have high TB rates due to factors which include poor access to health services, overcrowding, poor ventilation, and low level of awareness on TB. High bovine TB rates, and the prevalent consumption of unpasteurized milk by nomads compounds the problem. Nomadic communities suffer from poor access to health care, and rural areas often lack access to modern tools like AI-enabled CXR (AI-CXR), which can identify people with TB that symptom screening misses. Here, we present findings from active TB screening in Nomadic Communities using AI-CXR in Adamawa State, Nigeria.
Intervention or response: Between August 2024 and January, 2025, screening camps were organized in nomadic communities of Adamawa State; 37 screening sessions were conducted in 31 Nomadic communities using AI-

CXR to screen consenting individuals (≥15). People with AI score of ≥0.3 on qXRv4 were considered to have presumptive TB and had their sputum collected, transported and tested with GeneXpert MTB/RIF Ultra. Results were actively retrieved, people confirmed with TB were promptly linked to treatment while those with negative results were further evaluated by radiologists/medical officers for clinical management.

Results/Impact: A total of 1,348 (including 646 females) adults were screened with CXR-AI. Of these, 219 individuals (16%) had AI scores of ≥0.3 and were tested using GeneXpert MTB/Rif. 75 people were diagnosed with TB including 11 with Bac+ TB; 29 (39%) were females. All people diagnosed with TB were successfully initiated on treatment.

Conclusions: Use of portable AI-CXR for TB screening in Nomadic communities led to increased TB notifications in both Bac+ and all forms. Scaling this approach could improve the treatment coverage gap.

EP51-1189-21 Strengthening cross-border TB prevention and care through a one health approach among nomadic pastoralist communities in Kenya and Uganda

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Background and challenges to implementation: Cross-border collaboration is essential for TB control, particularly among mobile populations. West Pokot and Turkana counties in northeastern Kenya are high-TB-burden regions bordering Uganda, where nomadic pastoralist communities reside in remote settings with limited healthcare access and inadequate resources.

We share our experiences implementing a collaborative cross-border tuberculosis (TB) project by the Kenyan and Ugandan National TB Programs (NTPs) and two Counties along the Kenya and Ugandan border through a One Health approach.

Intervention or response: The USAID TIFA cross-border project was co-designed with stakeholders to strengthen cross-border TB coordination and capacity. We mapped diagnostic networks, treatment sites, human and veterinary resources, community resource persons (CRPs), and migratory routes. We selected 30 cross-border health facilities and trained healthcare workers (HCWs) and CRPs. Activities included contact tracing and screening, tracking patients lost to follow-up, and integrated community outreaches offering human and animal health services. Implementation was monitored through data review meetings, support supervision, joint review meetings, data quality assessments, and cross-border technical assistance from Uganda and Kenya NTP teams.

Results/Impact: Between May and December 2024, we trained 43 HCWs and 946 CRPs. TB was diagnosed in 477 patients, 286 (60%) with bacteriologic confirmation. Among 832 listed contacts; 571 (68.6%) were traced and 407 (48.9%) screened; 62 (15.2%) were presumptive and 21 were diagnosed with TB. Of 51 patients lost to follow up, 32 (62.7%) resumed treatment.

Further, 27 patients were referred across borders for continued treatment. A cross-border TB service directory and social media platforms were established to enhance coordination. A sustainability plan and documentation of lessons learned were developed.

Conclusions: Multisectoral cross-border TB control using the One-Health approach can enhance TB detection, treatment adherence, and continuity of care by improving coordination, data sharing, and access to services for mobile populations in remote, high-TB-burden pastoralist communities.

EP51-1191-21 Leaving no one behind: Targeted TB case finding in correctional facilities in Niger State, Nigeria

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Background and challenges to implementation: Congregate settings like correctional (prison) and detention facilities are high-risk environments for TB transmission, particularly in Nigeria where overcrowding is common. Undiagnosed TB cases in such settings can fuel rapid transmission.

This intervention aimed to identify and treat TB among incarcerated populations in Niger State, a key population often missed in routine surveillance.

Intervention or response: The approach involved mapping all prisons and detention facilities in Niger State, engaging correctional authorities, and retraining healthcare workers (HCWs) in facilities with clinics. For those without clinics, specimen referral systems were strengthened. NTBLCP R&R tools were introduced to improve data documentation. TB screening was institutionalized at clinic entry points and upon inmate admission.

Results/Impact: A total of 875 inmates were screened from the five (5) correctional facilities mapped in the state, with 520 presumptive TB cases identified and tested. Of these, 164 were diagnosed with TB, with no TB/HIV co-infections detected. The majority of cases (87%) were in the 15–54 age group, with those aged 45–54 years contributing the highest burden. Only 2% (3 cases) were female. However, only ten contacts were screened, and 4 eligible contacts were initiated on TPT, constrained by limited availability of shorter TPT regimens.

Screening Cascade									
	Total number of Person Screened for TB	Total number of presumptives	Presumptive DS-TB	Presumptive DR-TB	Examined for diagnosis	Total Examined with Xpert	Total Diagnosed	Total TB cases notified	HIV positive
Q3, 2024	428	332	330	2	332	332	115	115	0
Q4, 2024	447	188	183	5	188	188	49	49	0
Total 2024	875	520	513	7	520	520	164	164	0
Sex Disagregation of Notified persons with TB									
Q3, 2024	0-4	5-14	15-24	25-34	35-44	45-54	55-64	>65	Total
Male	0	0	21	23	23	40	5	0	112
Female	0	0	0	0	0	0	3	0	3
Total	0	0	21	23	23	40	8	0	115
Q4, 2024	0-4	5-14	15-24	25-34	35-44	45-54	55-64	>65	Total
Male	0	0	11	9	7	9	9	4	49
Female	0	0	0	0	0	0	0	0	0
Total	0	0	11	9	7	9	9	4	49

Conclusions: This targeted intervention demonstrated the effectiveness of active TB case finding in congregate settings. Strengthened collaboration with correctional services, consistent screening at entry points, and improved diagnostics were key to success. Introducing the use of portable digital X-rays (PDX) procured by the NTBLCP with Global Fund support for screening will improve the yield. Expanding this model nationally could close TB detection gaps in high-risk, underserved populations.

EP51-1192-21 Transforming TB preventing and care in prisons through policy and person-centered active case finding: A case from Padang City, Indonesia

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Background and challenges to implementation: Indonesia remains a high-TB-burden country, and correctional facilities are high-risk environments due to overcrowding, poor ventilation, and limited access to care. In Padang City, West Sumatra, three prisons housing 2,097 inmates reported only one TB case in 2021 and two in 2022. Low detection was linked to the absence of systematic screening, stigma, inadequate diagnostic capacity, and poor coordination between prison and public health services.

Intervention or response: In 2023, a joint TB control program between the Ministry of Health and the Ministry of Law and Human Rights was implemented, following Presidential Regulation No. 67/2021. The intervention included mass TB screening for all 2,097 inmates using mobile digital chest X-rays and symptom assessment.
A total of 451 individuals underwent GeneXpert (TCM) testing. Diagnosed cases were recorded in the national Si-TB registry, which enabled treatment initiation, monitoring, and continuity of care. Peer educators supported treatment adherence and TB awareness inside the prisons.
Results/Impact: The intervention identified 81 new TB cases in 2023, a significant increase from previous years. All cases received treatment and were monitored through Si-TB. This result demonstrated that active case finding, supported by national policy and cross-sector collaboration, dramatically improves detection in prisons. The integration of peer support also helped reduce stigma and improved engagement with TB services.
Conclusions: Person-centered, policy-supported TB services in prisons can significantly strengthen detection and treatment outcomes. The Padang experience highlights the importance of inter-agency collaboration, digital integration, and peer-led support in high-risk settings. This model offers a scalable and effective approach for TB control in correctional facilities across Indonesia and other high-burden countries.

EP51-1194-21 Impact of alcohol use on treatment outcomes amongst drug-resistant people with TB in Kenya

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Background and challenges to implementation: Drug-resistant tuberculosis (DR-TB) is a major health challenge in Kenya, exacerbated by alcohol use, which is linked to poor treatment outcomes such as delayed care, poor adherence, and treatment failure. Local data on the impact of alcohol on DR-TB outcomes is limited. This study aims to assess this relationship and inform integrated interventions.
Intervention or response: This retrospective cohort study analyzed data from 1,613 MDR-TB and XDR-TB patients diagnosed between 2023 and 2025 across 47 counties in Kenya. Demographics, alcohol use, treatment adherence, and outcomes (treatment success, failure, loss to follow-up) were extracted from the NTLD-P TIBU system.
Multivariate logistic regression was used to evaluate the relationship between alcohol use and treatment outcomes, adjusting for confounders.

Results/Impact: Among 1,521 patients, 27% reported alcohol use. Factors independently associated with alcohol consumption included male sex (aOR: 3.14), age (aOR per year: 1.02), severe malnutrition (aOR: 1.39), and community-based care (aOR: 0.53). Regional differences also affected alcohol use. Alcohol use was not independently linked to treatment outcomes after adjustment, though it was inversely associated with treatment success in univariate analysis (OR: 0.78). Favorable outcomes were associated with private/public sector care, longer treatment duration, and mono-resistant TB.
Conclusions: . Alcohol consumption negatively impacts DR-TB treatment, emphasizing the need for integrated care approaches that include alcohol reduction strategies to enhance TB treatment outcomes.
While alcohol use was associated with certain demographic and clinical factors, it did not directly influence treatment outcomes after multivariable adjustment. Its impact on adherence and immune function may indirectly affect treatment success. These findings highlight the need for integrated care, including alcohol management, to improve DR-TB outcomes, especially in high-risk areas.

EP51-1195-21 Leaving no one behind: Experience of piloting TB diagnosis and treatment service delivery to the conflict affected population in Myanmar

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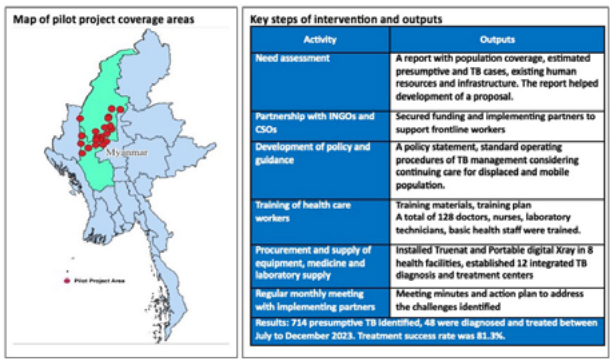
Background and challenges to implementation: The 2021 Myanmar coup and ongoing conflict severely disrupted healthcare access, including TB diagnosis and treatment in the conflict affected areas, exacerbated by medical supply restrictions, power outages, and communication disruptions.
To address this, volunteer health professionals formed the TB Technical Support Team (TB-TST) in mid-2022 and piloted a project in 21 townships of 2 administrative regions in 2023.
Intervention or response: The team conducted needs assessments, secured funding, and partnered with INGOs and CSOs, developed TB diagnosis and management policies and guidance and provided virtual training for healthcare workers, including medical technicians. Eight high-attendance health facilities were installed with Truenat and portable digital X-ray machines. The TB-TST also provides ongoing support and holds monthly partner meetings to address challenges.

Figure: Map of pilot project coverage areas and key steps of interventions



Results/Impact: In 2023, the integrated fixed/mobile primary health care clinics provided TB diagnosis and treatment services through ambulatory care with community health volunteer support. Between July to December 2023, 714 people with presumptive TB were identified and 48 were diagnosed and treated for TB.
Among those treated, medium age was 48 years (8-88 years in range), 75% were male, 25% were female, 90% were pulmonary TB and 10% were extra-pulmonary TB. Treatment success rate was 81.3% with 8.4% died, 6.3% loss to follow-up and 4.2% not evaluated.
The pilot's success enabled expanding TB service provision in 88 townships of 9 administrative regions in 2024. Monthly meeting minutes recorded that availability of essential medical and laboratory supply was the most profound challenge among others.
Conclusions: The use of advance technology such as Truenat and portable digital Xray, virtual training coupled with integrated ambulatory service delivery make possible providing essential TB services to the conflict affected population. Neglecting such underserved population would cost their lives and continuing transmission in the population.

EP51-1196-21 Bridging the rural TB care gap: Impact of Ayushman Arogya Mandir (AAM) integration into National Tuberculosis Elimination Programme in Uttar Pradesh, India

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Background and challenges to implementation: Tuberculosis (TB) remains a significant public health challenge in India, with rural populations disproportionately affected compared to urban. Despite existing services, nearly 64% of individuals with TB symptoms do not seek care from qualified providers, leading to delayed diagnosis and sustained transmission. Addressing this gap requires community-driven approaches to improve early detection and early treatment care access. The integration of Ayushman Arogya Mandirs (AAMs)—government-designated health and wellness centres—into the TB care pathway offers a strategic solution.

Armed with community-based health workers coordinated by Community Health Officer, AAMs are well-positioned to improve TB systematic screening, referral, and treatment outcomes in rural areas.

This study examines the impact of rural AAM engagement on presumptive TB enrolment, diagnosis, and treatment initiation within the public health system in Uttar Pradesh, India.

Intervention or response: Programmatic data (2023–2024) from Ni-kshay portal, India's web-based TB surveillance system in Uttar Pradesh was analysed. A structured AAM integration process, including facility registration, capacity building, monitoring and reviews for constructive actions, was implemented. Key TB indicators were compared across two years to assess improvements in service delivery.

Indicator	2023	2024
Total Enrolment in Public sector	18,23,390	33,83,380
Total AAMs engaged	12,166	14,744
Enrolment from AAM	4,14,265	12,21,546
% Enrolment from AAM to Total PHI	23%	36%
Total Positive from AAM (% positive of tested)	22,087 (5%)	29,235 (2.4%)
Microbiological confirmed cases from AAM	10,733	12,694
% Microbiological confirmed	49%	43%
Treatment initiation from AAM cases	10,254	28,217
% Treatment initiation	95%	97%

Results/Impact: The presumptive TB enrolment through AAMs increased three-fold from 0.41M (23%) to 1.22 M(36%) of the total public sector enrolment of 1.82M(2023) to 3.38 M(2024). The numbers of TB diagnosed increased from 22,087 to 29,235 and microbiological confirmation among diagnosed TB rose in number from 10,733 to 12,694. Although the proportion declined from 49% to 43%, indicate expanded reach but potentially broader screening of lower-risk individuals. Treatment initiation among AAM-diagnosed cases improved from 95% to 97%.

Conclusions: Integrating AAMs into the National Tuberculosis Elimination Programme significantly enhanced early TB case identification and early treatment initiation in rural communities. Scaling and sustaining this community-based model can play a pivotal role in achieving TB elimination goals, especially in high-burden, rural and hard-to-reach settings.

EP52 Preventing and finding TB in children and household contacts

EP52-1197-21 Reaching children where they are: The role of community and school-based TB screening during World Tuberculosis Day 2025 activities in Rivers State, Nigeria

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Background and challenges to implementation: Tuberculosis (TB) remains underdiagnosed in children due to non-specific symptoms, limited access to diagnostic tools, and poor health-seeking behavior. During the 2025 World TB Day activities in Rivers State, Nigeria, a strategic focus was placed on identifying TB in children by integrating community and school-based screening initiatives.
This study evaluates the effectiveness and TB yield from community and school-based TB screening activities among children during the World TB Day 2025 campaign in Rivers State.
Intervention or response: A one-week intensified TB case-finding campaign was conducted across selected communities, schools, and hospital outpatient departments (OPD) in Rivers State. Health education and TB awareness sessions were also conducted; children aged 0–14 years were screened using symptom checklists and portable digital X-rays (PDX). Sputum and stool samples from presumptive cases were tested with GeneXpert.
Children with symptoms or abnormal chest X-rays with negative bacteriological results were further evaluated clinically for TB diagnosis and treatment initiation. Data was analyzed using SPSS.
Results/Impact: A total of 5,746 children were screened: 44.4% in schools, 31.1% in OPD, and 24.6% in community settings. Overall, 1,029 children were identified as presumptive TB cases, resulting in a presumptive yield of 18%. Among these, schools accounted for 51.1% of presumptive cases, communities for 31.6%, and OPD for 17.3% ($X^2 = 96.4$, $p < 0.001$). TB was confirmed in 50 children (TB yield: 5.1%). Of the confirmed cases, 24 (46.2%) were detected in schools, 21 (40.4%) in communities, and 7 (13.4%) in OPD ($X^2 = 10.6$, $p = 0.005$); treatment initiation rate was 100%.
Conclusions: The 2025 World TB Day campaign strategy demonstrated that school- and community-based screening significantly enhances pediatric TB case detection.
These findings support the integration of TB services into child-centered environments and suggest that school health programs offer a viable strategy to improve pediatric TB control in Nigeria.

EP52-1198-21 Finding TB in children living with HIV: Results using the WHO-recommended algorithms in Conakry, Guinea

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Background: The diagnosis of pediatric tuberculosis (TB) remains a challenge, particularly in children living with HIV (CLWHIV). To guide clinicians' treatment decisions in children under 10 years of age, the WHO recommends two treatment decision algorithms (TDAs) that include scores to assess clinical and radiographic signs. We assessed the diagnostic cascade for pulmonary TB (PTB) in CLWHIV using these TDAs under programmatic conditions.
Design/Methods: From November 2023-December 2024, ambulatory CLWHIV under 10 years of age, followed on a bimonthly basis, and presenting with signs or symptoms suggestive of PTB were recruited from four health facilities in Conakry, Guinea, in a prospective observational study.
Results: Among 321 CLWHIV assessed for signs or symptoms suggestive of PTB, 159 presented with symptoms of PTB and were enrolled in the study and evaluated using the TDAs. Of the 321 children, 227 were assessed multiple times (median 3 times in the 14-month period). Among the 159 children with PTB symptoms, 106 (73%) underwent a TB-LAM test, 24 (15%) a GeneXpert stool test, and 93 (58%) a chest X-ray, due to intermittent availability issues. Only 3/59 (5%) children for whom the TDAs recommended a follow-up visit 7-14 days after consultation returned. In total, 105 children (66%) were initiated on anti-tuberculosis treatment.
Main reasons for starting treatment were a clinical or radiological TDA score above 10 points for 48 (46%) children, contact with a TB patient for 27 (26%), a positive TB-LAM for 26 (25%) and positive GeneXpert for 1 (1%) child.

Conclusions: The systematic use of TDAs led to a high proportion of CLWHIV receiving TB treatment, despite challenges with test availability and low follow-up return at 7-14 days in this ambulatory cohort. The clinical and radiological scores, history of TB contact and TB-LAM were the main algorithm elements leading to initiation of anti-tuberculosis treatment.

EP52-1199-21 Improving childhood TB diagnosis and notification through advanced sample collection technologies intervention: An insight from Malawi

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Background and challenges to implementation: World Health Organisation (WHO) estimates that 1.25 million children aged 0-14 years developed TB in 2022 worldwide, but over half remained undiagnosed or unreported. In 2023, Malawi reported 19,029 TB patients. Of these, 1,333(7%) were children aged 0-14 years against a national target of 2,295 childhood TB patients. This gap may be due to factors relating to childhood TB diagnosis.
Intervention or response: In 2023, Malawi National TB and Leprosy Elimination Program (NTLEP) trained healthcare workers from 15 selected health facilities in advanced sample collection technologies (ASCT) such as gastric lavage (GL), nasopharyngeal aspirate (NPA), induced sputum (IS); and other non-respiratory specimen collection techniques.
The intervention aimed at improving childhood TB diagnosis and case notification through advanced sample collection technologies (ASCT).
During implementation (January-December,2024), facilities conducted systematic TB screening to identify children with presumed TB and referred them for sample collection. Children who were unable to expectorate sputum were referred for GL; and if unsuccessful, samples were obtained through NPA or IS or stool. Non-respiratory samples were collected through other techniques.
All samples were tested through GeneXpert/MTB Rif Ultra. Children who either tested negative or failed to submit samples were clinically evaluated to determine if they had active TB and managed accordingly.
Results/Impact: The number of samples obtained through ASCT increased by 107% from 396 (January-December, 2023) pre-intervention period to 822 during intervention period (January-December, 2024). Concurrently, the number of children diagnosed with bacteriology-confirmed TB increased by 82%, from 11 to 20 patients. The proportion of childhood TB among total notified TB patients also improved from 7.7% to 8.6%.
Conclusions: Implementation of ASCT TB intervention by health facilities under routine health services delivery conditions can greatly improve childhood TB diagnosis and case-notification. NTLEP in collaboration with its stakeholders needs to put in place measures on how to sustain and scale up ASCT strategy in Malawi.

EP52-1200-21 The socio-cultural challenges affecting diagnosis of drug-resistant TB in children aged 0-4 years: Insights from KNCV Nigeria's experience

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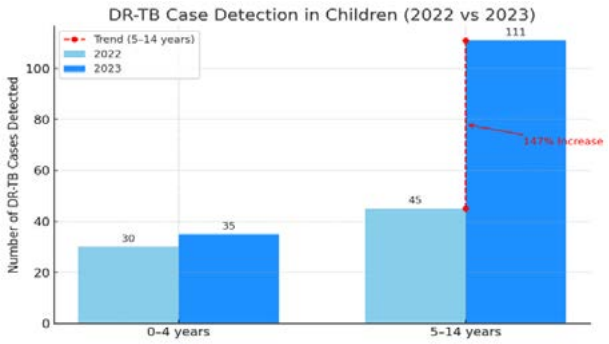
Background and challenges to implementation: Children under five are a vulnerable, often underdiagnosed group in the fight against drug-resistant tuberculosis (DR-TB). Unlike older children who can expectorate sputum, younger children require alternative samples like stool, which pose technical and socio-cultural challenges. Parental misconceptions, discomfort, and low awareness further hinder the uptake of stool sample collection.
This study explores how socio-cultural factors influence diagnostic barriers in pediatric DR-TB detection based on KNCV Nigeria's experience.
Intervention or response: In 2022 and 2023, KNCV Nigeria, through the USAID-funded TB LON 1 & 2 project, conducted active case finding in 14 supported states, screening children aged 0–4 years using stool samples and children aged 5–14 with sputum. Healthcare and laboratory staff were trained on pediatric DR-TB clinical features, GeneXpert diagnosis, and sample handling.
A qualitative survey involving key informant interviews and focus group discussions with mothers of children aged 0–4 identified barriers to stool sample collection. Low awareness and cultural discomfort were significant obstacles.
However, following targeted community sensitization and caregiver education, perceptions improved, leading to increased willingness to provide stool samples
Results/Impact: The data in the chart below shows that there is still a wide margin in DR-TB case detection among children aged 0-4 and 5-14. Case notification among children under five remained low despite screening efforts, underscoring the continued impact of both technical difficulties and caregiver-related barriers in stool sample uptake. The post-sensitization phase, however, showed im-

proved sample submission, suggesting that socio-cultural resistance is modifiable through engagement and education.



Conclusions: Low DR-TB detection in children under five is driven by technical and socio-cultural barriers. Improved caregiver's willingness for post-sensitization highlights the value of community engagement. Scaling caregiver education, culturally tailored awareness, and health worker training—while leveraging influences and support groups—can boost stool sample uptake and early diagnosis in this group.

EP52-1201-21 Prevalence of TB infection in school-going children in India: A scoping review

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Background: Over one-third of India's adult population is estimated to be infected with tuberculosis (TB). However, TB infection (TBI) prevalence among children in India is poorly characterized. School-aged children are at elevated risk of TB disease due in part to recency of infection and the unique immunological changes that occur during adolescence. As part of the TB Free Schools Initiative, we conducted a scoping review to estimate TBI prevalence among India's school-going children.
Design/Methods: We searched PubMed for papers published up to 2025 in English using a combination of MeSH terms and relevant keywords. Studies containing primary data on TBI positivity among school-going children in India were included. We abstracted data on school type, ages, and criteria for positivity. We pooled prevalence, calculated number needed to screen (NNS) to identify one child with TBI, and analyzed results by BCG vaccination status.
Results: A total of 84 relevant studies were identified, and 7 met inclusion criteria. All used purified protein derivative (PPD)-based tuberculin skin testing (TST) to identify TBI, each with a sample size >100 children (ages 5-19). The prevalence of TBI ranged from 5.0 -18.6%, and pooled prevalence was 13.4%. The NNS ranged from 5 to 10.
One study included children in a boarding school setting; otherwise, estimates were from day schools. Among 7 studies with estimates by BCG status, 5 reported higher TST positivity among vaccinated children.

Author	Year	Location	Age range	Type of TST	TU	Definition	Prevalence estimate	Number needed to screen
Dorjee et al.	2019	Himachal Pradesh[a]	5-19 years	PPD RT23 (Span Diagnostics)	5	Algorithm included: ruling out disease + ≥10 mm, measured after 24-72 hours	17.8% (930/5234)	6
Uppada et al.	2014	Andhra Pradesh	11-18 years	PPD RT23 with Tween 80 (Span Diagnostics)	2	≥10mm, measured after 48-96 hours	12.0% (794/6608)	8
Serane et al.	2014	South India[b]	10-14 years	PPD RT23 with Tween 80 (BCG lab, Guindy, Chennai)	1	≥10 mm measured after 24-72 hours	18.6% (112/601)	5
Kumar et al.	2009	Kerala	5-9 years	PPD RT23 with Tween 80	1	>10 mm measured after 72 hours	5.0% (241/4821)	10
Chadha et al.	2008	Banglore	5-8 years	PPD RT23 with Tween 80 (BCG lab, Guindy, Chennai)	1	>10 mm, measured after 72 hours	13.5% (452/3354)	7
Pulickalet al.	2007	Kerala	5-9 years	PPD RT23 (BCG lab, Guindy, Chennai)	1	≥10 mm in unvaccinated, ≥15mm in vaccinated, measured after 72 hours	15.6% (65/418)	6
Serene et al.	2001	Pondicherry	5-9 years	PPD RT23 (BCG laboratory, Guindy, India)	1	≥10 mm measured after 72 hours	18.6% (93/500)	5

Footnotes: State is not specified in the Serane et al. paper.[b] Abbreviations: PPD RT 23=Purified Protein Derivative RT 23; TST=Tuberculin Skin Test; TU=Tuberculin Units; BCG=Bacillus Calmette-Guérin; mm=millimeter.

Table. TB infection prevalence estimates among school-going children in India.

Conclusions: TST positivity among school-going children in India was high and suggests that up to half of all TBI in India occurs before adulthood. Active case finding for TB among school-children in India may be a high-yield strategy and targeting prevention efforts in this population may have population-level impact. Further research is needed to update TBI prevalence estimates among school-children in India and determine the yield of active case finding in this high-risk group.

EP52-1202-21 Integrated approach on case detection in children with unknown TB history in Nigeria: RAISING study

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Background: Tuberculosis detection and notification in children is quite poor, not up to national benchmark of 15%, and in 2023 Nigeria childhood TB notification was 10% amidst the high notification the country is reporting. The aims of this research are to determine the baseline of childhood tuberculosis detection among children (0-14

years), explore factors affecting poor childhood detection and integrate childhood tuberculosis screening as form of basic health screening using relevant stakeholders.
Design/Methods: This study approach was a mixed-method research that involved cross-sectional survey, qualitative research as well as workshop for relevant stakeholders.
Cross-sectional study survey was carried out and communities were randomly selected in Anambra state for the first phase of the research, stratified random sampling was also used to select the study sites. A serialized list of all DOTS clinic in Anambra state were included. Thereafter, DOTS sites were stratified based on their level of care as well as by ownership.
In all 20 facilities was selected, in 20 communities with 20 primary schools, 20 parents, 20 community leaders were all invited to this survey, with a simple random sampling applied. Sample size of 390 (3) was determined using the formula shown {n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)]}.
Results: The baseline of the study showed that tuberculosis diagnosis in children were basically by clinical screening by Physician and the use of Chest X-ray accounting for 92% of childhood TB notified with stool accounting for barely 8%. Childhood TB case finding algorithm is not really in place in health facilities, making it difficult for health workers to detect tuberculosis in children. Integrating TB screening for immunization can help improve TB case detection.
Conclusions: Finding the missing tuberculosis cases in children require integration of programmes, improving simple point of care testing for children and building capacity of health care workers in identifying tuberculosis in children.

EP52-1203-21 Isoniazid preventive therapy (IPT) and TB infection in intrahousehold contacts: Results from a cohort in Peru

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Background: Isoniazid Preventive Therapy (IPT) prevents TB progression among individuals with a positive tuberculin skin test (TST). However, its role in preventing TB infection remains uncertain. In Peru, IPT is recommended for all under five-year-old who are household contacts (HHCs) of TB patients, regardless of their TST status. We assessed the effectiveness of IPT in preventing TB infection—as measured by TST conversion at six months among initially TST-negative child HHCs.
Design/Methods: We conducted a longitudinal cohort study in Lima, Peru, in which we enrolled and followed HHCs of index TB patients. Here, we assessed the risk of TST conversion at 6 months among under-5s who tested TST-negative at enrollment, comparing those who received IPT to those who did not.
Although all under-5s were offered IPT, uptake was limited due to parental or physician preference. We used univariate and multivariate models to control for possible confounders.
Results: Among 1,004 under-5s who were TST negative at baseline, 562 (56%) received IPT. IPT did not protect against TST conversion but instead was associated with a modest increase in TST conversion at six months (Crude OR 1.49, 95% CI: 1.00–2.26, Adjusted OR 1.49, 95% CI: 0.98–2.30). Each additional week of IPT was associated with higher odds of TST conversion (adjusted OR 1.02, 95% CI: 1.00–1.04).
Conclusions: Although IPT is known to protect TST positive children from TB disease progression, here we find that IPT is associated with a modestly higher rate of TST conversion. This finding raises the possibility that IPT enhances the immune response to TB infection, paradoxically leading to increased TST induration size at the same time that it protects against TB disease progression.

EP52-1204-21 Cracking the code: How local leadership and smart collaboration boosted contact investigation and TB prevention in Indonesia

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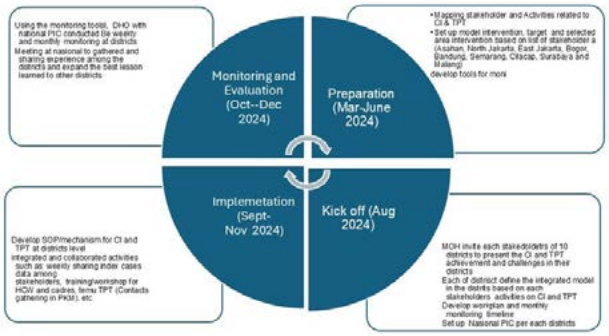
Background and challenges to implementation: To support TB elimination by 2030, Indonesia introduced contact investigation (CI) and tuberculosis preventive treatment (TPT) for household contacts in 2018. Despite multi-stakeholder support, by 2023 CI coverage reached only 32% and TPT coverage just 3.2%, both far below national targets. These gaps led to the development of an integrated and scalable CI-TPT model to accelerate progress.
Intervention or response: From September to November 2024, a pilot was conducted in 10 districts with support from the National TB Program, community organiza-

tions, and development partners. The intervention included coordinated planning, local data validation, and stakeholder alignment to boost performance.



Results/Impact: Three months post-intervention, CI coverage among household contacts increased to 79 % (21453/27096). TPT coverage rise to 14.8% (59,180 contacts who have been screened and eligible for TPT), marking significant progress from the 3.2% baseline.
Conclusions: Strong local leadership, regular data validation, and stakeholder coordination were key to improving CI and TPT performance. Tailoring interventions to district contexts and ensuring alignment among multiple partners enhanced efficiency. This collaborative model is being scaled up to 229 districts in 2025 to support Indonesia's TB elimination goals.

EP52-1205-21 Enhancing TB prevention and care through innovative contact tracing: Evaluating the effectiveness of the 2 km radius Spot-to-Tent Onion Model in Akwa Ibom State, Nigeria

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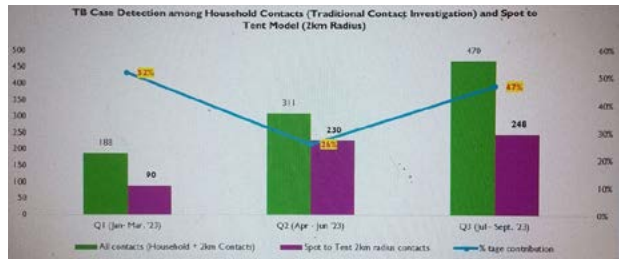
Background and challenges to implementation: Tuberculosis (TB) remains a significant public health concern, particularly in low- and middle-income countries like Nigeria. Contact tracing of contacts of index people diagnosed with TB is crucial for early detection and prevention of TB transmission. However, traditional contact tracing methods often have limitations, particularly in resource-constrained settings like Akwa Ibom State, Nigeria leading to low TB case detection among contacts – 6,023 Index Patients' contacts screened for TB, 1975 presumptive for TB evaluated, 272 contacts diagnosed with TB and 265 enrolled on TB treatment between January – September 2022.

Intervention or response: Implemented by KNCV Nigeria, the intervention involved TB Symptomatic screening around the residence of Index persons diagnosed with TB, within a 2 km radius "spot" using a "tent onion" approach, which prioritized high-risk contacts. Trained community health workers carried out TB symptom screening, sputum/stool collection, referral for diagnosis including Chest X-rays and linkage for TB treatment for persons diagnosed with TB across the 31 Local Government Areas of Akwa Ibom State.
Results/Impact: Within 9 months (January to September 2023) of implementation, **180,483** contacts were screened using the 2 km Radius Spot to Tent Onion Model, yielding **12,541** presumptive for TB. Of these, **12326** presumptive were evaluated for TB and results retrieved, **568** TB cases were diagnosed of which **4** were diagnosed with Drug Resistant TB and **546** enrolled on TB treatment, representing a **15%** increase in TB case detection for the state and an overall **41**% contribution to TB case finding among contacts during the period.



Conclusions: The 2 km Radius Spot-to-Tent Onion Model is a highly effective and sustainable intervention for increased TB detection among contacts of persons diagnosed with TB, particularly in resource-limited areas, by expanding contact tracing beyond households. This adaptable community-based screening strategy can be applied in various settings to enhance TB control and break the cycle of transmission.

EP53 Mobilising communities: The heartbeat of TB response

EP53-1206-21 Community-led monitoring for TB services in Geita, Tanzania: Lessons from the OneImpact TB Kiganjani approach

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Background and challenges to implementation: Geita, Tanzania faces significant TB service gaps, with 3,939 people engaged but persistent challenges in access to social support (77% of reported issues), nutritional support (15%), and financial support (3%). Stigma (12%) and human rights violations (3%) further complicate care, particularly for women (78% of reporters) and Key and vulnerable populations (KVP) including miners, fisherfolks, people living with HIV (PLHIV).
Intervention or response: With funding from the Stop TB Partnership through UNOPS, SHDEPHA+ implemented the Challenge Facility for Civil Society Round 12 from November 2023 to March 2025. The intervention utilized the **OneImpact TB Kiganjani** Community-Led Monitoring (CLM) approach to enhance health system accountability and foster meaningful community engagement.
Ten community health workers (CHWs) with Smartphones were trained in digital, app-based reporting tools, enabling the registration of 3,939 TB patients and facilitating active reporting from 5,354 individuals on TB-related service delivery issues.
To translate data into action, SHDEPHA+ convened five multi-stakeholder accountability meetings, during which 4,622 community-reported challenges were reviewed and discussed directly with health facility representatives.
Results/Impact: This community-driven CLM model reached 3,939 TB patients and generated 5,354 reports highlighting service gaps. Top issues included lack of social support (34%), nutrition (27%), and financial assistance (17%). Gender disparities were evident, with women accounting for 78% of reports. District-level variations showed reporting rates from 92% (Nyang'hwale) to 60% (Bukombe).
Overall, 61% of challenges were resolved through joint efforts between communities and facilities. These results underscore the power of digital tools and grassroots advocacy to promote equitable and accountable TB services.
Conclusions: The OneImpact TB Kiganjani model strengthened community-led accountability in TB services. By combining digital reporting with local engagement including women and KVPs it enabled timely identification and resolution of service gaps. District and gender differences signal the need for tailored interventions. This approach offers a replicable model for responsive, community-driven TB care.

EP53-1207-21 A systematic TB screening to improve notification rates in vulnerable and high-risk populations in Kathmandu Urban, Nepal

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Background and challenges to implementation: The National Tuberculosis (TB) Prevalence Survey, 2018-2019 showed TB prevalence in the Kathmandu Valley was 276/100,000. It also revealed that 72% of confirmed TB patients with abnormal chest X-rays (CXR) had no symptoms. Therefore, active TB case finding using CXR should increase TB case detection.
Intervention or response: Systematic TB screening using ultraportable digital chest x-ray (d-CXR) powered by artificial intelligence (AI) by a mobile team was conducted targeting vulnerable and high risk communities. Every participant above 15 years of age participated in the screening camp was eligible for CXR taking. The medical doctor read the CXR images with the necessary reference to the AI.
When the CXR images indicated presumptive TB, the field team advised sputum examination by WHO recommended mWRD. When d-CXR suggested TB disease such as cavitary and infiltrate, clinical diagnosis was made by the doctors even with a bacteriologically negative result. TB patients were linked to the nearest DOTS centre for treatment after the confirmation.
Results/Impact: From July 2022 to January 2025, out of 37020 participants screened with d-CXR, 2259 (6%) participants were eligible for sputum examination. As a result, a total of 323 (14%) TB patients were diagnosed, of which 56% were asymptomatic.Among them, 103 (32%) were bacteriologically positive and 220 (68%) diagnosed as bacteriologically negative.
The yield rate from this intervention is 0.87%, which is two times higher than the national average and treatment success rate was more than 90%.

Conclusions: Systematic TB screening with d-CXR in community and congregate settings is effective especially for asymptomatic TB patients, both bacteriologically (+) and bacteriologically (-) TB. In systematic TB screening, targeting the right population with the support of community volunteers is key to maintain high yield rates, however strengthening counseling sessions is equally important to improve treatment adherence among TB diagnosed cases in early stage.

EP53-1208-21 Designing effective TB programmes through community engagement: Lessons from TB REACH projects in South Asia

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Background: Tuberculosis (TB) remains a major public health challenge in South Asia. Alongside other health system barriers, stigma, limited awareness, and low levels of community involvement hinder timely diagnosis and treatment. Community engagement to adapt the design and implementation of TB programs is increasingly recognized as a crucial strategy to address these challenges and enhance access to care.
Design/Methods: We examined the role of community engagement in TB REACH projects across South Asia (2017–2021) through a mixed-methods approach. Quantitative analysis covered data from 59 interventions across 36 projects to assess the effectiveness of various community-based approaches in reducing pre-diagnostic and pre-treatment lost to follow-up. We conducted semi-structured interviews with programme implementers to understand best practices and challenges in incorporating community engagement for active case-finding projects for TB elimination.
Results: Key engagement strategies implemented were sputum transport (implemented by 64% of projects), incentives (49%), and awareness campaigns (86%). Overall, 70% of 533,573 people with presumptive TB were tested, ranging from 15%-96% across interventions and 82% of 38,968 confirmed patients started treatment (27%-100%). Testing rates were higher among interventions with awareness campaigns (table 1), which was supported by qualitative findings. Local stakeholders, including community health workers, played a pivotal role in bridging gaps between patients and services. Implementers stressed the importance of integrating community engagement for scalability and long-term impact. They also noted the difficulty of achieving project targets within a short timeframe without strong community support. Sustaining the long-term involvement of informal providers, CHWs, and volunteers remained a challenge.

Testing rate for strategy	Yes	No
Incentive Strategy	66% (13%–107%, n=16)	81% (15%–104%, n=20)
Awareness Activity Strategy	77% (13%–107%, n=31)	32% (15%–90%, n=5)
Sputum Transportation Strategy	63% (13%–107%, n=22)	86% (15%–104%, n=14)

Conclusions: Considering community engagement strategies are crucial in enhancing the delivery of TB care. Future TB initiatives should prioritize long-term community involvement, expand funding for grassroots interventions, and strengthen CHW training to support TB elimination goals.

EP53-1209-21 Addressing TB diagnostic delays in urban marginalised and unhoused populations of Delhi, India in project LEAD (Leveraging, Engaging, and Advocating to Disrupt TB Transmission)

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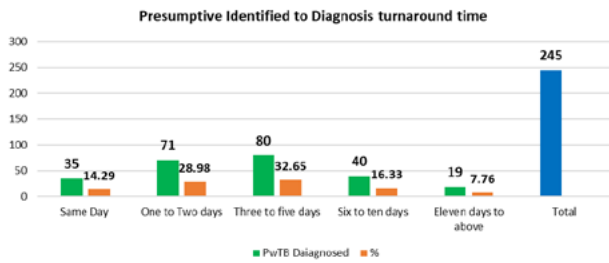
Background and challenges to implementation: Several scientific studies in India have revealed that delays in TB diagnosis contribute to increased TB transmission, increased morbidity, and higher mortality rates, especially among marginalised people like the urban unhoused, migratory and slum population. Furthermore, the frequent intra-city and inter-state mobility of these populations traditionally has been a challenge for the health system to locate and track, thereby lengthening the diagnostic pathway.
Humana People to People India (HPPI), a national-level NGO in India, demonstrated feasible ways to address the challenges of diagnostic delays through the LEAD project, implemented among urban unhoused, migratory, and slum-dweller populations in Delhi from October 15, 2024, to January 31, 2025.
Intervention or response: HPPI gave high priority to early tuberculosis diagnosis in project LEAD. Key implementation strategies included:
1. Community-convenient outreach activities.
2. High-quality screening with various tools (symptomatic, Chest X-ray and Cough-AI) to identify presumptive cases and facilitation of TB testing by NAAT at the local chest-clinics by SCT.

3. Tracking the missing presumptive cases by engaging local community members, and shelter caretakers.
4. Reduction of patient out-of-pocket expenses.
5. Partnerships and engagement with private laboratories for time flexible X-ray access.
6. Mobilise and accompanied for TB presumptive people to doctor consultation for clinical assessment.
7. Strengthening collaboration with National TB Elimination Program (NTEP).

Results/Impact: The detection of presumptive TB cases, and subsequently the diagnosis of PwTB was accelerated in project LEAD. PwTB were subsequently linked to local public health facilities for treatment, public health actions, and nutritional support, improving treatment adherence and contributing to TB prevention. (Detailed information in the attached table).



Conclusions: The targeted approaches of LEAD showcased, close support to TB presumptive cases, multi-partner collaboration, and community stakeholder engagement significantly improved prompt TB diagnosis and reduced diagnostic delays in the targeted populations in Delhi. This approach was appreciated by the state and central level NTEP and encouraged replication in other states.

EP53-1210-21 Accelerating cures: The race to fast-track BPaL access in Indonesia

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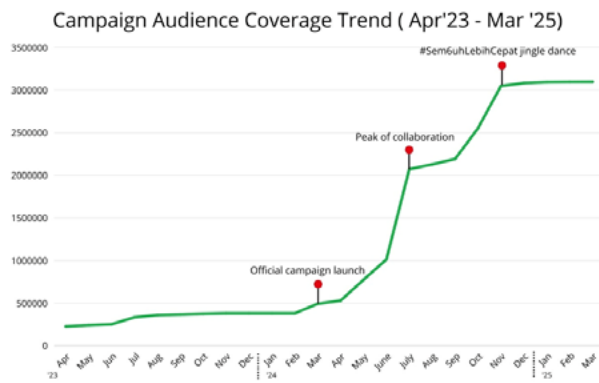
Background and challenges to implementation: In April 2023, Yayasan KNCV Indonesia (YKI), supported by the Stop TB Partnership and TB Alliance, joined the global Fast Track The Cure (FTTC) initiative to drive awareness, policy implementation, and healthcare worker capacity for the BPaL/M regimen. Prior to the campaign, only 87 patients had been enrolled, reflecting the limited reach of the regimen. Through targeted campaigns, the initiative strengthened community demand generation, engagement, and policy support. By November 2024, the regimen had benefited 4,309 patients across 38 provinces in Indonesia, highlighting the impact of sustained advocacy and stakeholder collaboration.

Intervention or response: 2023: Limited programmatic implementation of the bedaquiline-pretomanid-linezolid/moxifloxacin (BPaL/M) regimen, followed by campaign planning through focus group discussions, interviews, and surveys with TB stakeholders, including the Ministry of Health (MoH), healthcare workers (HCWs), DR TB survivors and TB civil society organizations (CSOs).

January 2024: Nationwide BPaL/M rollout and campaign development.

March 2024: Launch of the national campaign #Sem6uhLebihCepat to promote awareness and support for the new regimen, through 90 digital poster, 10 DR-TB survivor story, a short comic, a jingle dance competition, and 3 email newsletters.

Results/Impact: The campaign made a powerful impact, reaching 3.1 million people across social media as part of broader demand generation. This was fueled by widespread engagement, connecting with 2.07 million individuals, alongside collaborations with influencers that drew in 503,000 more. Campaign partner insights contributed an additional 273,000 individuals, while the lively, resonant Jingle Dance initiative engaged 252,000 participants. These efforts created a ripple effect, enhancing awareness. However, challenges such as stigma, limited access to digital materials, and insufficient stakeholder involvement must be addressed to sustain impact.



Conclusions: By engaging and empowering communities, the campaign helped accelerate BPaLM adoption in Indonesia, and amplified support for demand generation. Campaign underscores the transformative role of community engagement in expanding access to new TB treatments.

EP53-1211-21 Faith, culture and artificial intelligence in action: A people-centered community-led approach to TB elimination in hard-to-reach tribal communities of Mizoram, India

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Background and challenges to implementation: Mizoram, a 100% tribal state in Northeast India, presents unique challenges to TB elimination — ranging from difficult terrain and scattered populations to high HIV prevalence, tobacco use, and social stigma. Despite high literacy rates, health-seeking behavior remains low, especially among marginalized tribal groups such as the Mizo, Bru, and Chakma communities. Limited diagnostic infrastructure and health access further exacerbate underreporting and delayed care, leaving a significant proportion of TB cases undetected and untreated.
Intervention or response: To address these challenges, the State TB Cell of Mizoram, with support from freelance consultants and development partners under the Stop TB Partnership, launched the TB Elimination Accelerator Initiative in two key districts: Aizawl and Lunglei. The intervention was deeply rooted in cultural relevance and community ownership.
Faith-based platforms—particularly church congregations—were engaged to promote awareness and trust. Community leaders played a central role in mobilizing participation. Health camps were organized at preferred timings (evenings, early mornings, post-worship), and integrated screening for TB, diabetes, and hypertension was offered. AI-enabled tools such as handheld digital chest X-ray and cough analysis enhanced early detection. Trained community volunteers facilitated door-to-door outreach, identification of symptomatic individuals, and linkage to confirmatory testing and care services.
Results/Impact: (Within 7 months)
- Total individuals screened: 161,684
- Presumptive TB cases identified: 18,290
- TB cases diagnosed: 2,284

The initiative significantly improved case detection, reduced stigma, and increased uptake of TB Preventive Therapy (TPT), demonstrating success in high-burden, underserved areas.
Conclusions: The Mizoram model showcases an effective fusion of community trust, cultural insight, and technological innovation. It offers a scalable and adaptable framework for TB elimination in tribal and hard-to-reach populations, contributing meaningfully to India's and the global End TB strategy.

EP53-1212-21 Empowering youth in TB detection and linkage to care: Lessons from community-driven interventions in Turkana County, Kenya

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Background and challenges to implementation: Tuberculosis (TB) remains a leading cause of death from infectious diseases globally. A significant gap in TB control is the limited engagement of young people, particularly in high-burden, resource-constrained areas like Turkana County, Kenya, where the TB case notification rate is 345/100,000 far above the national average of 135/100,000. Stigma, low awareness, and barriers to healthcare access contribute to delayed diagnosis and treatment among youth.
This study examined the impact of participatory, youth-centered interventions on enhancing TB knowledge, reducing stigma, and improving healthcare linkages.
Intervention or response: The intervention used a multi-component, community-driven approach targeting youth aged 15–35 years. School-based outreach programs incorporated TB education into student health clubs. Social media campaigns via WhatsApp and Facebook disseminated tailored messages. Community theatre groups performed interactive dramas to tackle myths and stigma around TB with support from Amref and NTLD. Trained youth volunteers conducted door-to-door visits, offering TB screening and referrals. Community health promoters and local leaders supported these efforts to ensure cultural relevance and sustainability.
Results/Impact: The interventions led to significant improvements. Pre- and post-campaign surveys showed a 40% increase in TB knowledge among youth, who demonstrated improved understanding of transmission and prevention. Stigma reduction was observed as more youth openly discussed TB and sought testing. Over six months, the intervention reached 12,500 youths, a 60% increase over prior outreach efforts. Active case-finding identified 85 new TB cases among youth, all linked to treatment. Health facilities reported a 35% rise in youth-initiated TB screenings.
Conclusions: Community-driven strategies that prioritize youth participation, through school programs, social media, edutainment, and peer-led mobilization, effectively improve TB awareness, early detection and treatment in Turkana County. This approach holds promise for replication in other nomadic and underserved setting that help to bridge youth engagement gaps.

EP53-1213-21 Stakeholders' absolute engagement: A proven approach towards increasing community TB notification in rural Nigeria

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Background and challenges to implementation: Community TB case finding has been challenging in rural settings due to poor community buy-in. The GF Grant Cycle 7 (GC7) provided funding to support CBOs to engage community stakeholders and contribute to TB case finding. We report our experience of CBO-led stakeholder engagement and TB case finding in Nigeria.
Intervention or response: The study was a retrospective trend analysis of CBO-led stakeholder engagement and TB case finding from May 2024-February 2025 across 13 districts. The lead CBO deployed systematic community entry via advocacy to community leaders/gate keepers, this was followed by training of community volunteers (CVs) recruited within the districts. Then, active engagement of community stakeholders was carried out. Community outreaches and house-to-house active case search was performed. Also, sputum collection from presumptive TB cases, sample transportation by motorcycle riders and linkage-to-care of diagnosed TB cases was conducted by the CVs. Electronic data collection was performed using the CommTB App.
Results/Impact: During the period, over 150 engagement meetings among 857 stakeholders of underserved communities was performed. A total of 33,413 community members were screened for TB, 4372 persons had presumptive TB, and 433 community TB cases were notified consisting of 239 (55.2%) males and 194 (44.8%) females. Overall, monthly notification of community TB cases increased from 6 patients in May 2024 to 84 patients in February 2025. Community-based TB cases notified accounted 21% of total TB cases notified during the study period.
Conclusions: A CBO-lead stakeholder engagement and community-led TB case finding resulted in improvement in TB notification. This demonstrates the effectiveness of engaging stakeholders in ending TB.

EP53-1214-21 Leveraging health and wellness centres to strengthen decentralised TB services: A successful model in Himachal Pradesh, India

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Background and challenges to implementation: Himachal Pradesh, a high TB burden state of India with a prevalence rate of 208 per 100,000, faces challenges in TB care due to its mountainous terrain. The Ayushman Bharat initiative has strengthened primary healthcare through Health and Wellness Centres (HWCs), improving access to TB services at the community level.
This study evaluates HWC performance on key TB indicators and examines the accessibility of TB care, identifying strengths and areas for improvement.
Intervention or response: Since June 2022, Himachal Pradesh has implemented targeted interventions through its HWCs, focusing on trained human resources, community outreach, and case detection. A structured framework was aligned with the NTEP strategic plan.
Parameters assessed included i) referrals for presumed TB, ii) TB case holding capacity, iii) diagnostic yield, iv) Active case finding outcomes, v) post-TB follow-up results, and vi) access measured by median distance.
These parameters were compared for the year 2024 vs year 2022. Data was sourced from Ni-kshay (India's TB digital surveillance system) and state-specific mobile app, analyzed using SPSS v22.
Results/Impact: As of 2024, 2,483 Health and Wellness Centre (HWCs) are delivering TB services. From 2022 to 2024, number of presumed TB referrals increased from 10% to 27% [$z=128.67$, $p<0.05$], and diagnostic yield improved by 3.2%. Case holding rose from 18.6% to 37% [$z=36.50$, $p<0.05$]. Active case finding screened 1.7 million people (25% of the state population), identifying 4% as presumed TB. Post-TB follow-up reached 85% of 32,004 cases, with 2.4% as recurrent TB. Median distance for diagnostic access improved from 16 km (IQR: 20.5) to 4 km (IQR: 3) [$p<0.05$], reflecting better accessibility.
Conclusions: Himachal Pradesh has demonstrated that its successful implementation framework for decentralized TB services through HWCs effectively addresses service delivery gaps. This approach enhances TB care and presents a replicable model for achieving end-TB goals in similar remote and hard-to-reach areas.

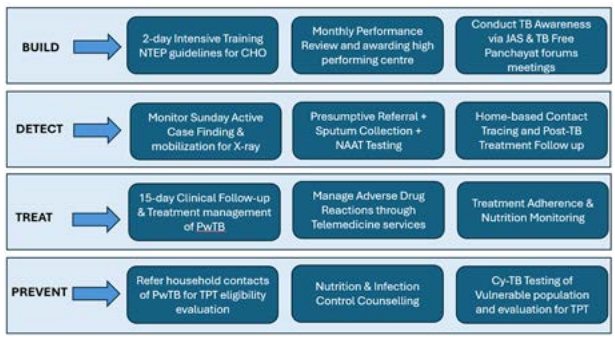

Figure. Implementation framework for decentralized TB services at the HWC.

EP54 Understanding tobacco use in a changing world: Insight on policy, risk and communication

EP54-1215-21 Communicating tangible research findings to non-statisticians: A case study of Tanzania GATS-2018

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Background and challenges to implementation: Tobacco use is one of the most common risk factors for non-communicable diseases (NCDs). 27% of all deaths in Tanzania are due to NCDs,

Tanzania conducted the Global Adult Tobacco Survey (GATS) in 2018, this was the first and nationally representative survey on tobacco use in Tanzania that aimed at informing stakeholders and guiding evidence-based decision-making in tobacco control.

Intervention or response: 4,976 households and 4,797 individuals 15 years of age and older were interviewed. households were sampled, and one adult (defined as 15 years of age or older) was randomly selected from each participating household to complete the GATS individual questionnaire. The overall response rate was 91.7%, with a household response rate of 95.1% and an individual response rate of 96.4%.

Results/Impact: 8.7% of adults currently use tobacco (smoking or smokeless), with a higher prevalence among men (14.6%) compared to women (3.2%). Rural populations exhibit a higher tobacco use rate than urban areas, indicating regional disparities in consumption patterns. Additionally,13.8 % of adults are exposed to secondhand smoke at home, while 32.9% face exposure in workplaces, highlighting the widespread health risks of involuntary smoke exposure.

Despite these challenges, the survey indicates that 76.8% of smokers are interested in quitting, yet access to cessation programs remains limited.

Conclusions: The findings call for strengthened tobacco control policies, enhanced public education, and improved cessation support to reduce tobacco use and its associated respiratory disease burden eg. Tuberculosis in Tanzania however the findings have not been effectively disseminated locally and internationally.

This abstract aims to communicate Findings and suggest innovative counseling and quitline to a wide community through this conference to inform policymakers, public health practitioners, and activists with actionable insights to help invest and advance tobacco control initiatives in the developing world especially in Tanzania.

EP54-1216-21 The effectiveness of quitline intervention on knowledge of harmful effects of smokeless tobacco use among residents of Ebonyi State, Nigeria

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Background: Smokeless tobacco is any product containing tobacco placed in the mouth or nose and not burned. Besides smoking, it is chewed, "dipped" or sniffed into the nose as finely powdered snuff. The use of Smokeless tobacco in Ebonyi state is of concern because while the use is widespread, knowledge of the harmful effects is poor.
The aim of this study was therefore to determine the effectiveness of quitline intervention on knowledge of the detrimental effects of smokeless tobacco use *among residents of Ebonyi state.*
Design/Methods: A quasi-experimental study to evaluate the effectiveness *of telephone quitlines on knowledge of the harmful effects of smokeless tobacco use.* Data were collected using anonymous pre-tested interviewer-administered questionnaires adapted from the Global Adult Tobacco Survey(GATS).
*K*nowledge was computed and the mean scores were ascertained. Poor knowledge was a knowledge score below 50 % while good knowledge was a knowledge score of 50% and above.
The mean scores were compared between groups using the independent samples t-test. P values of < 0.05 were considered statistically significant.
Results: There was a statistically significant difference in the proportion of participants who knew that using smokeless tobacco was dangerous to health 19(31.7%) pre-intervention and 52(86.7%) post-intervention $p<0.001$. In the intervention group, there was a statistically significant increase in participants with good knowledge of the harmful effects of smokeless tobacco use 0(0.0%) pre-intervention and 36(60.0%) post-intervention.
In the control group, there was a statistically significant increase in the proportion of participants with good knowledge of the harmful effects of smokeless tobacco use 0(0.0%) at the beginning of the study and 7(11.7%) at the end of the study.
Conclusions: There was a significant increase in the proportion of participants with good knowledge of the harmful effects of smokeless tobacco use post-intervention. Therefore, community members should be educated on the dangers of smokeless tobacco use.

EP54-1218-21 Dissecting Article 5.3: Understanding stakeholders' perspectives on tobacco industry interference and gaps in governance

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Background: Article 5.3 of the WHO Framework Convention on Tobacco Control (FCTC) mandates governments to protect public health policies from tobacco industry interference. Yet, its enforcement remains uneven across Indian states and Union Territories (UTs). The current study estimated the strengths, weaknesses, opportunities, and threats (SWOT) associated with Article 5.3 implementation through multi-sectoral stakeholder consultation.
Design/Methods: A structured SWOT framework was used in a cross-sectional qualitative study across India. Purposive sampling was used to identify key informants such as government officials, NGO leaders, legal experts, public health professionals, and researchers. Data were gathered through over three months (Jan- Mar) using a questionnaire with six themes: respondent background, strengths, challenges, opportunities, threats, and recommendations. Qualitative data were analyzed thematically using framework analysis; quantitative Likert-scale responses were summarized descriptively.
Results: Stakeholders provided a mixed perspective of Article 5.3 implementation, with an average effectiveness score of 2.8/5. Weaknesses included enabling legal frameworks (72%), inter-sectoral collaboration (65%), and best practices in certain states. However, 87% indicated policy gaps in conflict-of-interest, and 80% mentioned that policymakers and health staff had insufficient awareness or training. Weak monitoring (68%) and funding issues (74%) were also identified.
In spite of adversity, opportunities for enhancing implementation were graded 4.2/5, with most opportunities lying in civil society activism, online media, youth mobilization, and foreign technical assistance. Threats graded 4.1/5, with more than 60% citing frequent industry interference via lobbying, CSR initiatives, and policymaker contacts, in addition to economic interdependencies.
Background and challenges to implementation: Article 5.3 of the WHO Framework Convention on Tobacco Control (FCTC) mandates governments to protect public health policies from tobacco industry interference. Yet, its enforcement remains uneven across Indian states and Union Territories (UTs). The current study estimated the strengths, weaknesses, opportunities, and threats (SWOT) associated with Article 5.3 implementation through multi-sectoral stakeholder consultation.
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Conclusions: Strengthening Article 5.3 enforcement in India calls for firm legal protection, capacity development, and relentless multisector efforts. These conclusions provide strategic guidance to policymakers, advocates, and international partners seeking to counteract tobacco industry meddling.

EP54-1219-21 Oral nicotine pouches: A summary of potentially applicable laws and regulatory challenges in India

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Background and challenges to implementation: ONPs are small rectangular pouches made of organic cellulose compounds, of the size of Chicklet gums. Nicotine in ONPs can be derived from tobacco plants or is synthetic. In traditional smokeless tobacco products such as chewing tobacco or snus, there is tobacco leaf. are used for Nicotine intake with hundreds of youth-attracting flavours and varied content of 1-43 mg/pouch. Nicotine Replacement Therapy (NRT) products help people quit smoking safely and are approved by the FDA or similar national agencies.

While ONPs are available worldwide, there is little information on how to regulate them. This study summarises ONP regulatory policies in India.

Intervention or response: This review summarises findings obtained from various Indian websites dealing with policies and legislation. We also requested information on the applicable policies and analyzed responses from subject experts from various states in India.

Results/Impact: The study found that India regulates both synthetic and tobacco-derived nicotine products and generally relies on existing policies for Tobacco/Nicotine products. ONPs can be acted upon in India under multiple laws such as the Drugs and Cosmetics Act of 1940, the Food Safety and Standards Act, of 2006, the Poisons Act of 1919, the Insecticides Act of 1968, the Juvenile Justice Act of 2015 which prohibits sale to minors, Environmental Act 1986, Legal Metrology Act 2009 and Directorate of Revenue Intelligence can act under the Customs Act of 1962. The online sale of illegal Nicotine can be curbed by the State Cyber Crime Wings. There are challenges in the enforcement of various applicable laws in the country.

Conclusions: Our work offers novel insight into ONP national regulatory approaches in India. These are regulated under the existing laws. It offers a roadmap for how India and other countries can add effective measures to the use of these and other non-medicinal nicotine.

EP54-1220-21 TAPS exposures, smoke-free area policies, and individual factors influence the intention and smoking behaviour among adolescents in Central Java, Indonesia

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Background: The Indonesia Health Survey 2023 reveals that about 70 million people smoke, with 7.2% including teenagers aged 10 to 18. Central Java province shows one of the highest child prevalence rates in Indonesia, reported at 9.6%. This study aims to evaluate the impact of environmental factors (tobacco advertising, promotion, and sponsorship exposure), policy, and personal factors on smoking intentions and behavior in adolescents.

Design/Methods: This is a cross-sectional study involving a sample of 882 students from ten junior high schools, eleven high schools, and five universities from the three

main municipalities in Central Java Province: Semarang City, Pekalongan District, and Banjarnegara District. The stratified sampling was employed to select respondents and self-administered questionnaires were utilized to gather data. Consent from parents is required for respondents under 18 years of age before participation. The prevalence odds ratios (POR), were calculated to evaluate the impact of tobacco marketing and other factors on smoking.
Results: The percentage of smoking among students is 26.3% (47.4% in males, 12.4% in females). Most of them smoke cigarettes (44.9%), 23.3% use e-cigarettes, and 31.7% are dual users. The individual and environmental factors significantly influence smoking intention. The male, with lower attitudes and knowledge, is more likely to intend to smoke, with POR of 4.4, 2.0, and 1.6, respectively. The high exposure to TAPS (POR 1.4) and inadequate enforcement
of smoke-free regulations (POR I.4) convey a higher opportunity for the intention to smoke. Moreover, adolescents with the intention to smoke are 11.4 times more likely to become smokers. Additional risk factors for smoking behavior include male gender (POR 6.0), low knowledge (POR 2.0), low attitude (POR 1.8), and high TAPS exposure (POR 1.4).
Conclusions: Enacting total TAPS ban regulation is essential for reducing smoking prevalence. Educational and empowering initiatives for youth must be implemented to avert tobacco marketing influences.

EP54-1221-21 Vaping and pregnancy in the last decade: Mapping scientific progress, research gaps, and evolving themes (2014–2025)

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Background: The use of electronic cigarettes (e-cigarettes) has increased alongside declining traditional smoking rates. Marketed as a safer alternative to tobacco, e-cigarettes contain fewer toxicants, leading to widespread perceptions that they pose minimal health risks, even during pregnancy. However, research on vaping's impact on maternal and fetal health remains limited. This bibliometric analysis examines publication patterns, identifies research gaps, and highlights emerging themes related to vaping in pregnancy.
Design/Methods: This study quantitatively assessed scientific publications indexed in Scopus between 2014-2025, using specific keyword combinations related to pregnancy and electronic cigarette exposure. The final sample included 3529 articles. Analysis focused on three key bibliometric domains: publication trends, geographic contributions, and thematic areas. VOSviewer and PyBibX facilitated visualization through co-authorship and keyword co-occurrence analysis.
Results: Analysis revealed significant growth in publications, particularly accelerating from 2019 onward. The International Journal of Environmental Research and Public Health, Nicotine & Tobacco Research, and Tobacco Control were most productive, accounting for 18.3% of publications. Research was geographically concentrated in the United States (41.2%), United Kingdom (17.6%), and Australia (11.8%), with developing nations contributing only 7.4%. Publications averaged 14.2 citations, with 2018-2020 articles showing highest impact. Keyword co-occurrence analysis identified four distinct clusters: nicotine neurodevelopmental pathways (32.7%), comparative risk assessment (28.4%), adverse birth outcomes (24.3%), and cessation interventions (14.6%). Co-citation networks revealed limited integration between toxicological and clinical research.

Conclusions: This analysis emphasizes escalating scholarly concern regarding impact of vaping during pregnancy. The predominance of research originating from high-income countries highlights a lack of representation from developing countries, limiting generalizability of findings. Thematic analysis indicates a shift from broad safety concerns to pregnancy-specific investigations; however, disciplinary silos, especially between toxicological and clinical research, hinders understanding of vaping's effects on pregnancy. Addressing these limitations through interdisciplinary collaboration, geographically diverse research is essential to inform evidence-based public health policies.

EP54-1222-21 Digital epidemiology of tobacco consumption: A Google Trends analysis of lung cancer and e-cigarette interest in India

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Background: Lung cancer is rapidly emerging as one of India's most concerning health concerns, and its increasing popularity is proving difficult to overlook. The primary risk factor is smoking, and India is the second-

largest consumer globally, after China. Despite the ban on e-cigarettes in 2019, public debate regarding their health implications continues, influencing public attitude and information seeking. This research uses Google Trends to examine e-cigarette and lung cancer web search volume in India and delineates regional trends for effective tobacco control intervention**.**

Design/Methods: Google Trends data (Jan 2020–Mar 2025) were also contrasted for the search terms of „lung cancer" and „e-cigarettes" in 28 states and 8 union territories. Search Volume Index (SVI) values were also adjusted for population variation.

Geographic intensity of search was GIS-mapped, and Pearson's and Spearman's association tests were used to determine correlations between searches. K-means cluster separated the states according to interest levels in searches, while Moran's I test tested spatial autocorrelation to identify geographic clustering.

Results: Interest by region differed; Delhi (SVI: 87), Maharashtra (SVI: 82), and Karnataka (SVI: 78) reported the highest combined interest. E-cigarette and lung cancer search had a strong positive correlation ($r = 0.48$, $p < 0.01$). E-cigarette searches corresponded to a 10 unit increase in search units being associated with a 3.1 unit increase in interest units in lung cancer ($\beta = 0.31$, $p = 0.007$) per the regression analysis. Spatial clustering analysis (Moran's $I = 0.25$, $p < 0.01$) indicated extensive geographic patterns.

Conclusions: Local differences in search patterns indicate differences in public perception and possible misinformation. The resilience of e-cigarette popularity after the ban underscores the necessity for highly focused digital health campaigns. Google Trends is a good way to track public opinions and guide tobacco control interventions among high-burden nations.

EP54-1223-21 Smoke and strain: A global bibliometric exploration of smoking's impact on TB treatment outcomes

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Background: Smoking is a significant risk factor for poor tuberculosis (TB) treatment outcomes. Evidence suggests that smokers are more likely to experience treatment failure, delayed sputum conversion, relapse, and mortality. Despite the increasing volume of research, a comprehensive bibliometric synthesis of global evidence on this association is lacking. This study aims to map and evaluate global scientific output on the association between smoking and TB treatment outcomes.

Design/Methods: A bibliometric analysis was conducted using the Scopus database, yielding 2,471 documents related to smoking and TB treatment outcomes. A comprehensive search strategy was developed using Boolean operators (AND, OR) to combine terms such as "tuberculosis," "TB treatment," "smoking, "tobacco use," "treatment failure," "mortality," and "sputum conversion." The search included title, abstract, and keyword fields.

Data were analyzed using Biblioshiny (R software), to assess publication output, citation trends, author and institutional productivity (Lotka's Law), core journals (Bradford's Law), co-authorship patterns, keyword co-occurrence, and thematic evolution.

Results: Analysis showed that 5% of journals accounted for nearly 33% of publications, and the top 10 authors contributed about 6% of the total output. High-frequency keywords such as "treatment failure," "mortality," "sputum conversion," and "smoking cessation" highlighted the global research focus on the association between smoking and TB outcomes. Thematic mapping showed a shift toward integrated tobacco cessation within TB programs. The United States, India, China, and the United Kingdom together contributed over 35% of publications. International collaborations were seen in over 40% of the documents. Research gaps persist, particularly in standardizing outcome measures and covering low-resource high-burden countries.

Conclusions: This study confirms the global scientific commitment to exploring the smoking–TB outcome link and underlines the need for integrated cessation interventions in TB care. Findings will inform policy and guide future research priorities.

EP55 Novel diagnostics and treatment monitoring methods

EP55-1224-21 Rapid detection of drug-resistant *M.tuberculosis* using a multiplexed CRISPR droplet platform

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Background: Drug-resistant tuberculosis (TB) poses a critical threat to global health, with multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains undermining treatment success. Conventional drug susceptibility testing (DST) is time-consuming and inaccessible in many low-resource settings. Rapid, multiplexed genetic testing methods are urgently needed to improve patient care and inform public health interventions.
Design/Methods: We developed a CRISPR-Cas12a-based diagnostic platform for rapid detection of key drug resistance mutations in *Mycobacterium tuberculosis*. The system uses multiplex PCR with primers targeting conserved regions adjacent to drug resistance-associated mutations (e.g., *rpoB*, *katG*, *inhA*, *gyrA*, *rrs*). Each amplicon contains mutation hotspots specific to resistance phenotypes. Guide RNAs (gRNAs) were engineered to recognize these mutations, enabling Cas12a activation and fluorescent signal release. A color-coded droplet system was used to isolate individual CRISPR reactions, each tagged with a unique color for simultaneous analysis.
Results: The assay successfully distinguished wild-type from drug-resistant alleles in clinical isolates within 90 minutes. The color-encoded droplet format allowed unambiguous multiplexing of up to six drug resistance markers in a single reaction. Sensitivity and specificity exceeded 95% when benchmarked against sequencing-confirmed clinical samples. The platform was robust, portable, and required minimal instrumentation.
Conclusions: Our multiplexed CRISPR droplet platform enables rapid, precise identification of drug-resistant *Mtb*, offering a scalable tool for clinical diagnostics and surveillance. This approach holds promise for decentralized TB testing and accelerated treatment decisions, particularly in high-burden, resource-limited settings.

EP55-1225-21 A CRISPR-Cas13a-based molecular assay for rapid and accurate detection of *M. tuberculosis*

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Background: The growing global burden of tuberculosis (TB) underscores the urgent need for rapid, cost-effective, and accurate diagnostic tools to enhance disease detection and management. Current diagnostic methods often face limitations in sensitivity, turnaround time, and accessibility—particularly in resource-constrained settings. To address these gaps, we aimed to develop a sensitive and specific molecular assay for detecting *Mycobacterium tuberculosis* (M.tb) using a CRISPR-based platform.
Design/Methods: We developed a new molecular assay integrating a preamplification step with CRISPR-Cas13a-based detection. The assay was designed using CRISPR-derived RNAs (crRNAs) targeting the conserved *rpoB* gene of M.tb. Its performance was evaluated using DNA from 200 clinical M.tb isolates, non-tuberculous mycobacteria (NTM), and other bacterial species.
Further validation was carried out using clinical pulmonary sputum samples (n=60) and urine samples (n=60), with culture as the reference standard. Based on the initial results, we incorporated additional targets—*IS6110* and *IS1081*—to develop a multiplex version of the assay to enhance sensitivity.
Results: The CRISPR-Cas13a assay targeting *rpoB* achieved a limit of detection (LOD) of 20 copies/µL of M.tb DNA and showed no cross-reactivity with NTM or other bacteria. It demonstrated 100% sensitivity (200/200) for detecting DNA from clinical M.tb isolates. In sputum samples, the assay showed a sensitivity of 95.5% and specificity of 93.3%. In non-invasive pediatric urine samples, it achieved a sensitivity of 68% and specificity of 100%. The multiplex assay, targeting *rpoB*, *IS6110*, and *IS1081*, further improved sensitivity, reaching an LOD of just 1 copy/µL, while maintaining high specificity.
Conclusions: CRISPR-Cas13a assay demonstrates excellent sensitivity without compromising specificity for detecting *M.tb* in sputum and urine samples. The inclusion of multiplex targets significantly improved assay performance and warrants further validation in clinical settings. These findings highlight the potential of this platform as a promising, alternative diagnostic approach for TB, especially in low-resource environments.
High sensitivity without compromising the specificity.

EP55-1226-21 One-pot CRISPR gel assay for urine-based diagnosis of TB

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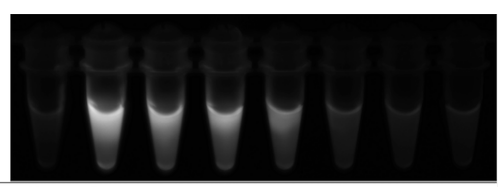
Background: Urine-based molecular diagnostics for tuberculosis (TB) offer non-invasive testing but face several limitations, including low sensitivity and less optimized in resource-limited settings. A novel diagnostic platform, the CRISPR gel assay, combines the traditional CRISPR-Cas12a reaction with recombinase polymerase amplification (RPA) in a one-pot isothermal gel-based format. This approach enables target nucleic acid detection with minimal equipment and manual handlings. It has shown promise for rapid and sensitive nucleic acid detection but not yet been applied to *Mycobacterium tuberculosis* (MTB).
Our objective was to evaluate its analytical performance in detecting MTB and compare it with the Xpert MTB/RIF Ultra.
Design/Methods: DNA was extracted from the H37Rv strain of MTB cultured in Löwenstein–Jensen medium using DNeasy Blood & Tissue Kit (QIAGEN) and spiked into urine samples from healthy individuals. CRISPR gel was prepared by combining an agarose gel with the CRISPR-Cas12a reaction mix. RPA reagents (TwistAmp Basic kit, TwistDx) were added to the gel, and the reaction was incubated at 40˚C for 90 minutes.
We experimentally selected the best primer set targeting MTB and compared the CRISPR gel assay with the Xpert MTB/RIF Ultra.
Results: The CRISPR gel assay successfully detected MTB DNA in urine without background noise. When using the most sensitive primer set among those tested, the assay achieved a limit of detection of 0.001 ng/μL, comparable to that of the Xpert MTB/RIF Ultra (0.001 ng/μL).



	Neg cont	Pos cont	1x (0.1ng/μL)	10^{-1} x	10^{-2} x	10^{-3} x	10^{-4} x	10^{-5} x
CRISPR gel	–	+	+	+	+	–	–	–
XpertMTB/RIF Ultra		+ Mid Ct:16.5	+ Low Ct:17.5	+ Low Ct:19.9	+ Trace Ct:27.2	– Neg	– Neg	

Conclusions: Under optimal conditions, the CRISPR gel assay demonstrated detection sensitivity comparable to the Xpert MTB/RIF Ultra, highlighting its potential as a sensitive diagnostic tool for TB in resource-limited settings. To advance the diagnostic applicability of the CRISPR gel assay, further optimization of transrenal DNA detection and clinical validation in TB-endemic settings is needed.

EP55-1227-21 Utility of Nanopore sequencing for the detection of drug-resistant TB in Kyrgyzstan

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Background and challenges to implementation: Rapid and accurate detection of drug-resistant tuberculosis is critical for timely and appropriate treatment initiation. Targeted next generation sequencing (tNGS) represents a promising alternative to conventional drug susceptibility testing (DST).
This study evaluated the utility of nanopore sequencing for TB drug resistance detection in Kyrgyzstan.
Intervention or response: From January 2024 to February 2025, adults with Xpert MTB/RIF-positive sputum were enrolled from four regions in Kyrgyzstan. Sputum samples were subjected to standard of care (SOC) DST, including line probe assay (LPA) and phenotypic DST (pDST). Nanopore sequencing was performed using the early access tNGS TB assay targeting 24 resistance-associated genes covering 16 anti-TB drugs, including all BPaL drugs (OND-CUST-KIT on MinION MK1B, Oxford Nanopore Technologies (ONT).
Results/Impact: Of 997 enrolled participants, 597 (60%) had complete tNGS and SOC results. Among these, 267 (45%) had TB resistant to ≥1 drug by SOC: 115 (19%) to isoniazid but not rifampcin and 117 (20%) to both rifampicin and isoniazid. Median turnaround times for LPA, pDST and tNGS were 4 (IQR:3–6), 26 (IQR:20–34) and 28 (IQR:15–50) days, respectively. The long turnaround time for tNGS was due to frequent delays in shipment of reagents and lack of trained staff in the first months of the study. In times when reagents and staff were available, the turnaround time of tNGS was 6 days (IQR: 5–8).
Six patients showed bedaquiline resistance, detected by either tNGS only (n=2), pDST only (n=1), or by both (n=3). tNGS predicted pretomanid resistance in six cases, while pDST for pretomanid was not performed.

Conclusions: tNGS has the potential to significantly enhance the speed of TB drug resistance detection. The ONT tNGS TB assay showed added value for detecting resistance to newer drugs like bedaquiline and pretomanid. These findings support the integration of tNGS into national diagnostic algorithms.

EP55-1228-21 Nanopore targeted next-generation sequencing for the timely prediction of drug resistance in *M. tuberculosis* complex clinical specimens in Tanzania

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Background: Targeted next-generation sequencing (tNGS) presents a unique opportunity for early detection of drug-resistance-conferring mutations in *Mycobacterium tuberculosis* complex to the most important anti-tuberculosis drugs in a single test, which can be conducted within one day.
This study aims to determine patient-important outcomes of using tNGS compared to standard of care (SOC) drug susceptibility testing (DST) using line probe assays (LPAs) and phenotypic DST for the detection of tuberculosis (TB) drug resistance in Tanzania.
Design/Methods: Since the end of January 2025, we have been enrolling adults (≥18 years) with TB confirmed on Xpert MTB/Rif Ultra (Xpert) in a multicenter prospective study including 24 health facilities in Tanzania. Patients are followed up for TB treatment outcomes.
Nanopore sequencing is done using the early access TB assay on MinION devices, targeting 24 genes related to 16 anti-TB drugs, including all BPaL drugs, followed by data analysis using the wf-tb-amr (v2.0.0-alpha.3) EPI2ME analysis workflow (Oxford Nanopore Technologies (ONT)).
Results: Thus far, till April 2025, 163 patients have been enrolled, and for 92, sputum samples were sequenced. All 92 samples were rifampicin susceptible on Xpert; the ONT TB assay showed consistent results for all but one sample, for which rifampicin resistance, as well as resistance to isoniazid, ethambutol, pyrazinamide, and ethionamide, was predicted. The ONT tNGS TB assay predicted isoniazid resistance for three additional samples, with one confirmed by LPA. One sample showed resistance to delamanid and pretomanid only. Phenotypic DST results are pending.
Conclusions: The preliminary results indicate that the ONT tNGS TB assay provides a comprehensive evaluation of drug resistance compared to the currently approved SOC methods, for which phenotypic DST results are pending.
Our study highlights the potential of tNGS to support accurate and timely clinical decision-making, which will ultimately improve treatment outcomes among TB patients.

EP55-1230-21 Evaluation of urine lipoarabinomannan and host transcriptional molecular biomarkers for diagnosing TB in symptomatic individuals with negative culture results

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Background: Urine and blood-based molecular tests for tuberculosis (TB) are promising additions to the rapidly developing TB diagnostic pipeline that can aid in diagnosing sputum culture-negative TB. We evaluated the performance of two novel assays in detecting TB in symptomatic culture-negative individuals.
Design/Methods: TB culture-negative and culture-positive sputum, blood, and urine were collected from a study of symptomatic adults undergoing clinical evaluation for TB in Uganda, Kenya, and South Africa.
Participants were followed over 12 months, and culture-negative individuals were classified as TB positive or negative using a microbial criterion (MC) based on Mtb mRNA and longitudinal Ultra and culture (standard and augmented) results and a clinical criterion (CC) based on clinical diagnosis.
Urine was analyzed directly via a novel urine lipoarabinomannan enzyme immunoassay (uLAM) that uses an S4-20 IgG capture antibody and an A194 IgM detection antibody. Total RNA was extracted from blood and analyzed using an 81-gene Nanostring panel for PREDICT29 and ACS-COR TB-associated host response signatures (HRS). Cutoffs were derived from the Youden index for ROC curves separating TB-negative controls from clinically confirmed positives.
Results: From 184 followed participants, 112 were TB culture-negative but microbiologically or clinically classified as positive. 4 subjects (3.6%) were uLAM positive only, 47 (42.0%) were HRS positive only, 3 (2.7%) were positive for both and 58 (51.8%) were negative for both. Sensitivity, specificity and AUCs for each assay were estimated (Table 1).

A significant association was observed between TB status and uLAM positivity for the MC (OR=4.48,p=0.005). Positive trends were observed between TB status and uLAM positivity (OR=2.68,p=0.07) and HRS positivity (OR=1.71,p=0.09) for the CC.

	Microbial criteria			Clinical criteria			Controls	
	Sensitivity (95% CI)	Specificity (95% CI)	AUC (95% CI[1])	Sensitivity (95% CI)	Specificity (95% CI)	AUC (95% CI[1])	Sensitivity[2] (95% CI)	Specificity[3] (95% CI)
uLAM	0.13 (0.05–0.28)	0.96 (0.90–0.99)	0.66 (0.54–0.77)	0.08 (0.03–0.18)	0.95 (0.87–0.98)	0.54 (0.43–0.65)	0.45 (0.26–0.66)	1.00 (0.78–1.00)
HRS	0.47 (0.31–0.64)	0.56 (0.45–0.67)	-	0.49 (0.36–0.62)	0.59 (0.46–0.70)	-	0.90 (0.70–0.97)	0.95 (0.76–0.99)
PREDICT29	-	-	0.53 (0.43–0.64)	-	-	0.57 (0.46–0.67)	-	-
ACS-COR	-	-	0.53 (0.41–0.64)	-	-	0.51 (0.40–0.62)	-	-

[1]From 2000 stratified bootstrap replicates.
[2]Based on 20 culture positive, smear positive samples.
[3]Based on 14 healthy volunteers for uLAM and 20 healthy volunteers for HRS.

Table 1. Sensitivity and specificity of the uLAM and HRS assays to detect culture-negative TB based on microbial and clinical criteria (n = 112), and to detect TB based on results from culture-positive, smear positive subjects and healthy volunteers.

Conclusions: uLAM and HRS assay performances were limited against exploratory microbiologic and clinical criteria based on longitudinal data. However, logistic regression results suggest the biomarkers are associated with TB status and imply that test performance could improve with additional optimization.

EP55-1231-21 Microfluidic-based molecular rapid diagnosis for tongue swab and sputum samples: A multicentre study

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Background: Tongue swabs, as a non-invasive sampling modality, have been investigated for tuberculosis diagnosis in multiple countries. However, China has not yet conducted research on tongue swab-based tuberculosis (TB) detection using molecular rapid diagnostics, particularly low-complexity automated nucleic acid amplification tests (LC-aNAATs).
This study evaluated the diagnostic accuracy of a novel molecular rapid diagnostic system Genewise-MTBC for pulmonary tuberculosis using tongue swab and sputum samples.

Design/Methods: This study was conducted across 4 designated TB hospitals in China, enrolling 547 participants with suspected pulmonary TB. The LC-aNAAT used was Genewise-MTBC from Genewise Bio, a microfluidic technology-based system integrating magnetic bead-based nucleic acid extraction and qPCR, capable of detecting TB within 45 minutes.
Tongue swabs and sputum samples were obtained from all participants. Sputum samples underwent smear, MGIT culture, and Xpert MTB/RIF (Xpert), while both tongue swabs and sputum samples were tested using Genewise-MTBC.
Results from all methods were compared and analyzed using the microbiological reference standard (MRS) of sputum as the reference.
Results: Among the 547 enrolled patients, a total of 448 (81.90%) cases were clinically diagnosed with pulmonary tuberculosis, including 283 (63.17%) MRS-positive patients; 99 (18.10%) cases were diagnosed with other pulmonary infections. Based on sputum MRS, the sensitivities of sputum smear, sputum MGIT culture, and sputum Xpert were 42.05%, 57.24%, and 88.69% respectively. Sputum Genewise-MTBC achieved superior performance with 94.35% sensitivity, 100% specificity, and 97.07% concordance. Using sputum MRS as the reference, tongue swabs tested with Genewise-MTBC showed 80.85% sensitivity, 100% specificity, and 90.13%.
Conclusions: Our findings establish that LC-aNAATs exhibit superior sensitivity compared to sputum smear and culture. Genewise-MTBC demonstrated higher sensitivity than Xpert.
Additionally, tongue swab testing with Genewise-MTBC shows promising sensitivity, suggesting that tongue swabs could be considered as a complementary or alternative sample type for TB diagnosis and even screening.

EP55-1232-21 Machine learning combined with plasma multi-omics analysis helps diagnose TB progression in high-risk populations

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Background: Non-sputum blood tests have the potential for rapid diagnosis of active tuberculosis (ATB) in high-risk populations. Our goal is to develop new biomarker combinations using multi-omics approaches to assist in the diagnosis of TB progression.
Design/Methods: This is a sub-study of an open-label, randomized clinical trial of preventing TB in the silicosis patients (ClinicalTrials.gov number: NCT02430259). 26

ATB participants (TB progressor group) were matched in a 1:1 ratio with 26 individuals (non-TB progressor group).

Metabolomic and proteomic analyses of plasma were performed using ultrahigh-performance liquid chromatography-tandem mass spectrometry. Potential markers were selected based on differential analysis, univariate and Receiver Operating Characteristic Analysis. The joint diagnosis model was constructed using Support Vector Machine (SVM) and internal cross-validation was performed

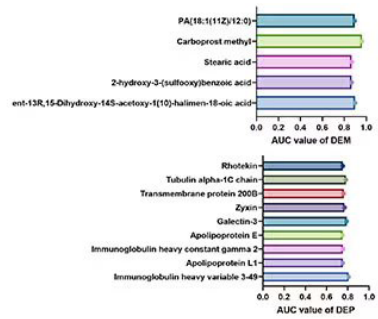

Figure1.AUC value of seleced DEP and DEM
*DEP:differentially expressed proteins
*DEM:differentially expressed metabolites

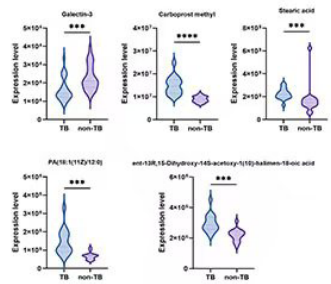

Figure2.Expression level of comprehensive biomarkers

Table1 . Relevant parameters of SVM machine learning method.

Diagnostic Biomarker Panel	AUC	Sensitivity	Specificity	95% CI	Accuracy
Proteome Biomarkers Panel	0.9375	1.0000	0.8750	0.6977-0.9984	0.9250
Metabolome Biomarkers Panel	0.8000	1.0000	0.6000	0.4439-0.9748	0.8667
Comprehensive Biomarker panel	1.0000	1.0000	1.0000	0.6915-1.0000	1.0000

*Proteome Biomarkers Panel: Immunoglobulin heavy variable 3-49; Apolipoprotein L1; Immunoglobulin heavy constant gamma 2; Apolipoprotein E; Galectin-3; Zyxin; Transmembrane protein 200B; Tubulin alpha-1C chain; Rhotekin.
*Metabolites Biomarkers Panel: Stearic acid;PA(18:1(11Z)/12:0); Carboprost methyl; ent-13R,15-Dihydroxy-14S-acetoxy-1(10)-halimen-18-oic acid;11-Dehydro-2,3-dinor-txb2;2-hydroxy-3-(sulfooxy)benzoic acid
*Comprehensive biomarker panel: Galectin-3; Stearic acid; Carboprost methyl; PA (18:1(11Z)/12:0); ent-13R,15-Dihydroxy-14S-acetoxy-1(10)-halimen-18-oic acid.

Results: 75 differentially expressed proteins were identified between progressors and non-progressors. Nine proteins with the area under the curve (AUC)>0.75 were selected to form the proteome biomarkers panel (Galectin-3; Immunoglobulin heavy variable 3-49; Apolipoprotein L1; Immunoglobulin heavy constant gamma 2; Apolipoprotein E; Zyxin; Transmembrane protein 200B; Tubulin alpha-1C chain; Rhotekin). The AUC of the panel was 0.9375 (95% confidence interval (95%CI): 0.6977-0.9984; specificity: 87.50%; sensitivity: 100%).

Among the 144 differentially expressed metabolites in the two ionization modes, 5 metabolites with variable importance in projection >2 and AUC >0.85 (PA(18:1(11Z)/12:0); Stearic acid; Carboprost methyl; ent-13R,15-Dihydroxy-14S-acetoxy-1(10)-halimen-18-oic acid;2-hydroxy-3-(sulfooxy)benzoic acid) were selected as metabolites biomarkers panel. The AUC was 0.8 (95%CI:0.4439-0.9748; specificity: 60%; sensitivity: 100%).

Based on the variable importance order obtained by SVM analysis, a comprehensive biomarker panel including 1 protein and 4 metabolites (Galectin-3; Stearic acid; Carboprost methyl; PA (18:1(11Z)/12:0); ent-13R,15-Dihydroxy-14S-acetoxy-1(10)-halimen-18-oic acid) was developed. This combination can characteristically and correctly allocate the progression and non-progression groups with an AUC of 1 (95%CI: 0.6915-1) and a specificity and sensitivity of 100%.

Conclusions: We proposed a comprehensive biomarker panel for predicting tuberculosis progression to enhance early diagnosis and treatment in high-risk populations.

EP55-1233-21 Development and clinical validation of a novel method for simultaneous rapid molecular drug susceptibility testing of rifampicin, isoniazid and fluoroquinolones

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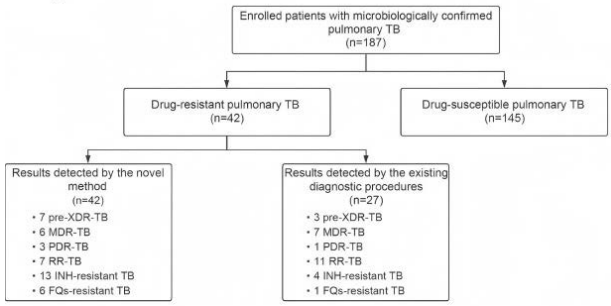
Background: Laboratory-based drug resistance diagnosis plays a central role in therapeutic decision-making for drug-resistant tuberculosis (DR-TB). Molecular drug susceptibility testing (DST), characterized by its rapidity and accuracy, holds significant clinical value for the early diagnosis of DR-TB. The WHO recommends fluoroquinolone resistance testing for multidrug-resistant TB (MDR-TB) and rifampicin-resistant TB (RR-TB) patients. Although genetic mutations associated with resistance to rifampicin (RIF), isoniazid (INH), and fluoroquinolones (FQs) demonstrate strong predictive efficacy, there is currently no molecular DST kit in China capable of rapidly and simultaneously diagnosing resistance to these three drug classes.

Design/Methods: Using the low complexity automated nucleic acid amplification test (LC-aNAAT) system from Genewise Bio, we developed a detection kit capable of identifying resistance-associated mutations for RIF, INH, and FQs within approximately 60 minutes as a novel rapid molecular DST method. We consecutively enrolled 187 microbiologically confirmed pulmonary TB patients from our hospital. MGIT-cultured strains or sputum samples were tested using the new kit, with results compared against GeneXpert MTB/RIF outcomes and conventional DST results. Resistance findings from the new kit were validated by Sanger sequencing.

Results: Among the 187 cases, the novel method detected 42 DR-TB cases (Fig.A), including RR-TB, mono-resistant TB (MR-TB), poly-drug-resistant TB (PDR-TB), MDR-

TB, and pre-extensively drug-resistant TB (pre-XDR-TB). Except for one failed sequencing case, all resistance results were confirmed by Sanger sequencing. Of the 42 DR-TB cases, 27 were previously identified through existing diagnostic procedures, while 15 were newly detected by the novel method (including 9 INH-resistant, 5 FQs-resistant and 1 MDR-TB cases). Notably, INH/FQs-resistance was detected in 8 known cases (Fig.B).

A. Study profile



B. Record table of drug resistance results

No.	Resistance diagnosis results				No.	Resistance diagnosis results			
	RIF	INH	FQs	Classify		RIF	INH	FQs	Classify
1	●	●	○	pre-XDR-TB	22		○		MR-TB（INH）
2	●	●	○	pre-XDR-TB	23		○		MR-TB（INH）
3	●	●	○	pre-XDR-TB	24		○		MR-TB（INH）
4	●	●	○	pre-XDR-TB	25		○		MR-TB（INH）
5	●	●	●	pre-XDR-TB	26			○	MR-TB（FQs）
6	●	●	●	pre-XDR-TB	27			○	MR-TB（FQs）
7	●	●	●	pre-XDR-TB	28			○	MR-TB（FQs）
8	○	○		MDR-TB	29			○	MR-TB（FQs）
9	●	○		MDR-TB	30			○	MR-TB（FQs）
10	●	○		MDR-TB	31	●			RR-TB
11	●	●		MDR-TB	32	●			RR-TB
12	●	●		MDR-TB	33	●			RR-TB
13	●	●		MDR-TB	34	●			RR-TB
14	●		○	PDR-TB	35	●			RR-TB
15	●		○	PDR-TB	36	●			RR-TB
16	●		●	PDR-TB	37	●			RR-TB
17		○		MR-TB（INH）	38		●		MR-TB（INH）
18		○		MR-TB（INH）	39		●		MR-TB（INH）
19		○		MR-TB（INH）	40		●		MR-TB（INH）
20		○		MR-TB（INH）	41		●		MR-TB（INH）
21		○		MR-TB（INH）	42			●	MR-TB（FQs）

● The drug resistance results of the novel method are consistent with those of existing diagnostic procedures
○ The drug resistance results additionally detected by the novel method
○ The drug resistance results missed by the novel method

Conclusions: Reliance solely on RIF-resistance testing may overlook INH or FQs resistance, introducing uncertainty in treatment. Our novel method enables rapid combined resistance detection with excellent sensitivity and specificity, providing robust support for the early diagnosis of DR-TB patients.

EP55-1234-21 TB-MBLA: Design and development of TB molecular bacterial load assay, a monitoring tool for treatment response

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Background: There are several Standard of Care (SoC) tests to diagnose Mycobacterium tuberculosis (MTB), but they are not suited to monitor disease progress in real time. Molecular tests targeting DNA and smear microscopy do not differentiate between viable and dead bacteria. Culture methods detect viable bacteria but can take up to six weeks and are prone to contamination. The Tuberculosis Molecular Bacterial Load Assay (TB-MBLA), developed by Professor Stephen Gillespie's group at the University of St Andrews (UStAn), uses 16S rRNA as a marker of TB viability in sputum. This Reverse Transcriptase (RT)- qPCR is molecular, quantitative, culture-free and allows for treatment monitoring in real time.
Design/Methods: A collaboration between UStAn and LifeArc took the TB-MBLA through Feasibility and Analytical Verification to ISO 13485 Design and Development (D&D) standards, and included real-time stability testing. Performance of TB-MBLA was assessed using Smear-positive sputum samples (FIND Biobank).
Results: During Feasibility the cycling conditions and primer/probe concentrations were optimised by carrying out a thorough assessment of the assay design to check for cross homology.
During Analytical Verification several performance parameters were tested using three independently manufactured kit batches. This included Limit of Detection (LoD), which was established at 128 copies-per-reaction (c/rxn), and Limit of Quantification (LoQ) at 256 c/rxn. All performance parameters met Design Input requirements.
Real-time stability testing was run over a period of 24 months to assess the TB-MBLA assay mix and controls at several time points. No significant change in performance was observed during this testing period, showing the components to be highly stable.
Testing of Biobank sputa demonstrated a strong concordance of TB-MBLA and Smear grading, with 100% sensitivity and 97% specificity.
Conclusions: Overall, testing showed the TB-MBLA to be very robust and was ready for clinical evaluation in the LifeArc sponsored TIME Study.

EP56 From policy to practice: Strategic alignment to fight TB

EP56-1235-21 Collaboration practices in TB research in Peru: Perspectives from TB researchers and clinicians

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Background: Peru has the highest incidence of tuberculosis (TB) in the Americas. The World Health Organization has identified collaborative research practices as key actions needed to achieve the End TB Strategy. Peru's National TB Program (NTP) has implemented the National Tuberculosis Research Network (RENAI-TB) to achieve this goal. This study identifies the main facilitators and barriers experienced by TB researchers and NTP provincial directors (NTPPDs) regarding the collaboration practices.
Design/Methods: We conducted a two-part explanatory sequential study comprising a mixed-methods analysis of survey and interview data. The first part comprises a survey targeting researchers who have published at least one scientific article about TB between 2017-2019, and TB clinicians working as NTPPDs. The second part includes semi-structured interviews. Both components focus on their experience doing TB research and RENAI-TB. Responses were analyzed following the grounded theory framework, using Atlas.ti.
Results: Of the 65 participants invited, 36 completed the survey, and 9 TB researchers and 7 NTPPDs participated in follow-up interviews. Researchers identified conferences and pre-existing relationships with peers as facilitators of collaboration practices, and government bureaucracy, researchers' territorial attitudes around research sites, competitive funding opportunities, and lack of protected time for research as major obstacles. NTPPDs reported no participation in research activities due to their heavy workloads, lack of dedicated research time, and limited institutional prioritization. Respondents proposed the creation of financial incentives to support research engagement, professional recognition, and state-funded research training. RENAI-TB was recognized as a potential vehicle that might be leveraged to support this effort.
Conclusions: Collaborative practices in TB research occur among researchers through natural interactions with peers. It is necessary to address systemic health barriers and create policies that support new models of collaboration and research training initiatives for NTP TB clinicians and researchers to advance the country's efforts toward TB elimination.

EP56-1236-21 A global survey of TB management policies in prisons

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Background: Due to overcrowding and poor ventilation, prisons are high-risk environments for transmission of tuberculosis. However, little is known about how tuberculosis control programs approach management of the disease in these settings.
Design/Methods: We conducted a global survey among national tuberculosis program representatives in all World Health Organisation (WHO) regions to better understand policies regarding tuberculosis management in prisons at the country-, regional-, and global-level.
We included questions regarding tuberculosis screening, diagnosis, preventive treatment, and continuity of care after prison release, amongst other aspects of tuberculosis control. Responses were analysed by country and WHO region.
Results: We received 125 responses from 89 countries spanning all six WHO regions. Most responses (n=41, 33%) were from the European region. Almost half (N = 54 / 114; 47%) of respondents reported that their national tuberculosis guidelines included policies specific to prisons. 49 of 92 (53%) officials reported that all detainees are screened for tuberculosis at prison entry. Most respondents (94%) reported using some form of directly observed therapy for tuberculosis treatment in prisons. The most-reported challenge regarding implementation of guidelines for tuberculosis management in prisons was overcrowding (52% of respondents) (*Table 1*).
The use of GeneXpert for TB diagnosis was highly heterogeneous by region; almost all respondents from Southeast Asia (100%) and Africa (95%), responded positively while only half (50%) responded positively in the Eastern Mediterranean region.
Challenges to policy implementation also varied by region; prison overcrowding was cited by most respondents in Southeast Asia and Africa, but by only 32% in the Western Pacific.

Table 1. Policies for TB management in prisons and barriers to their implementation, by WHO region (percent of respondents indicating each policy/barrier)

WHO Region, N responses	Prison-specific policies included in national TB guidelines	Challenges to implementation of TB management guidelines in prisons (a)			All detainees screened for TB at entry into prison (b)	Screening tools used at entry: chest X-ray or molecular test in addition to clinical evaluation	GeneXpert used for initial TB diagnosis	Directly observed therapy (DOT) implemented (c)	Post-release follow-up of those on treatment: policy in place for referral to local health centre
		Prison overcrowding	Lack of healthcare staff	Lack of healthcare infrastructure					
AFRO, N = 25	66.7	83.3	45.8	58.3	57.9	57.9	94.7	100.0	100.0
AMRO, N = 17	50.0	37.5	56.2	37.5	53.8	83.3	69.2	86.7	73.3
EMRO, N = 2	50.0	50.0	50.0	50.0	0.0	100.0	50.0	100.0	100.0
EURO, N = 41	50.0	45.7	40.0	40.0	56.7	63.0	75.9	100.0	100.0
SEARO, N = 10	66.7	75.0	62.5	50.0	60.0	60.0	100.0	66.7	60.0
WPRO, N = 30	18.5	32.1	32.1	32.1	47.8	80.0	73.3	90.9	78.3

Percent of respondents indicating each policy/barrier
0.0 20.0 40.0 60.0 80.0 100.0

TB=tuberculosis. WHO=World Health Organisation. WHO Regions: AFRO=Africa, AMRO=Americas, EMRO=Eastern Mediterranean, EURO=Europe, SEARO=Southeast Asia, WPRO=Western Pacific.
(a) Only the top 3 reported challenges are included in this table.
(b) Only those reporting that all detainees are screened (in all prisons) are included in this category –those reporting that detainees are screened in some but not all prisons are not counted here.
(c) Includes detainees receiving DOT either directly in prison cells or by reporting to DOT centres. Only those reporting DOT use in all prisons are counted here.

Conclusions: This is the first global survey of current policies regarding tuberculosis screening, diagnosis, and treatment in prisons. Results suggest that, while many countries have prison-specific tuberculosis management guidelines, challenges in this setting hinder implementation. Furthermore, heterogeneity in responses across and within countries suggests variation in policy implementation.

EP56-1237-21 Improving grants management through business central systems to fight TB, leprosy and lung diseases in Kenya

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Background and challenges to implementation: Kenya has long faced persistent challenges in community-based TB case finding. Donor-funded programs have played a key role in implementing various interventions, however, smooth implementation is hindered by weak grants management systems. Inefficient fund disbursement slows down implementation and affects the supply of essential commodities, tools, and implementation of various interventions.
Intervention or response: To enhance grants accountability and TB outcomes, Amref Health Africa, the Global Fund's non-state Principal Recipient deployed Microsoft Dynamics 365 Business Central ERP across 38 subrecipients in all 47 Kenyan counties. The system replaced manual sub-granting processes that caused disbursement delays, financial discrepancies, and limited oversight. It enabled real-time financial tracking, automated reporting, and performance monitoring. A phased rollout (2021–2023) included training, data migration, and testing. Monitoring was conducted via built-in dashboards and quarterly reports. Data on reporting accuracy, turnaround time, and absorption rates assessed system impact, supported by regular feedback sessions.
Results/Impact: All 38 subrecipients transitioned to digital grants management. Through the implementation of this system, financial cost eligibility rose from 50% (2021) to 76% (2023), Financial submission errors were reduced by 24%, quarterly cash disbursement delays dropped by 50% and fund absorption rose from 63% to 98% by year two. Improved grant performance led to timely procurement and enhanced TB implementation of TB interventions. Kenya saw a 25% rise in TB notifications (2021–2023) and national declines in TB mortality (37 to 27), TB/HIV mortality (24 to 14), and incidence (267 to 223 per 100,000, 2019–2023).
Conclusions: Digital solutions like Business Central can significantly enhance grants management, enabling timely disbursements, better reporting, and resource tracking which is critical for timely TB interventions. Sustained capacity building and scaling to other programs can accelerate progress toward ending TB and achieving universal health coverage.

EP56-1238-21 Inequities in the production of TB-related social protection policies across municipalities in Rio de Janeiro, Brazil (2014–2024)

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Background: Normative regulation is a critical step for implementing social protection measures. In high TB burden settings, the absence of formal policies may hinder access to comprehensive care.
This study assessed the municipal-level distribution of normative documents related to TB and social protection in the state of Rio de Janeiro from 2014 to 2024.
Design/Methods: We analyzed 79 records corresponding to 75 normative documents collected from official municipal sources. Documents were grouped by municipality and year of publication. Descriptive analysis was performed, supported by a grouped bar chart to visualize the frequency and distribution of documents over time.

Results: The analysis revealed marked disparities in normative activity across municipalities. Cities such as Magé and Belford Roxo showed relatively high production of social protection regulations. Conversely, other municipalities with high TB burden—such as São João de Meriti and Duque de Caxias—did not publish any related normative acts during the study period.
These findings point to significant inequities in institutional engagement and capacity for policy development in critical areas (Figure 1).

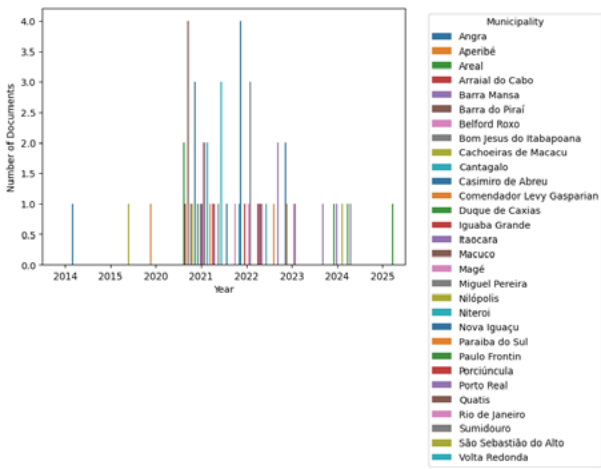

Figure 1 - Distribution of Social Policy Documents by Municipality and Year.

Conclusions: The unequal distribution of social protection policy production reveals structural differences in institutional capacity and political will across municipalities. These disparities may undermine TB care continuity, especially in vulnerable regions. To address this, regionalized technical support and federative coordination strategies should be prioritized to reduce normative gaps and promote equitable policy action. Strengthening local governance capacity is essential to ensure all high-burden municipalities are equipped to implement and sustain TB-related social protection measures.

EP56-1239-21 Institutionalising nutritional support for people with TB into the local self-governance annual plans in Kerala, India: A policy reform initiative

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Background and challenges to implementation: In 2023, Kerala, India, reported 21,309 tuberculosis (TB) cases. The state has a strong local governance structure comprising 941 Grama Panchayats (GPs) and 93 Urban Local Bodies (ULBs) which has supported TB elimination efforts since 2012, including nutritional support for Persons with TB (PwTB). However, audit concerns and the lack of clear policy guidelines led many local bodies to withdraw their support. Further challenges arose from the inconsistent participation of *Nikshay Mitras (*voluntary donors encouraged to provide nutritional support to PwTB) affecting the goals of the Pradhan Mantri TB Mukt Bharat Abhiyaan.
In response, the State TB Cell engaged policymakers for sustainable, policy-backed nutritional support mechanism.
Intervention or response: To address this policy gaps related to TB nutrition support in GPs and ULBs, the State TB Cell under the Directorate of Health Services conducted a series of policy deliberations, stakeholder dialogues, analytical reviews, and expert consultations. This has explored various mechanisms, and policy instruments for integrating TB nutrition support into Local Self Governance.
Results/Impact: These discussions generated strong momentum and brought attention to challenges in financial audits and compliance. On March 6, 2025, the Local Self Government Department issued an official directive (G.O. (Rt) No. 623/2025/LSGD) with new policy guidelines to all GPs and ULBs to include nutritional support for TB patients in their annual plans. The directive provides permissive sanction for GPs and ULBs to supply monthly nutritional food kits worth INR ₹1,500 to consented TB patients for up to 21 months. The policy enables implementation through multiple funding sources, including Development Grants, Own Funds, Fifteenth Finance Commission Grants while emphasizing monitoring, awareness, systematic evaluation and sustainability.

Conclusions: This policy advocacy successfully integrates the TB nutritional support within Kerala's decentralized governance, creating a scalable and accountable model. This initiative is expected to strengthen local ownership, ensure sustainable funding, and enhance TB treatment outcomes.

EP56-1240-21 Strategies for managing global shortages of first-line anti-TB medicines: A case study of the National TB Programme in Nigeria

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Background and challenges to implementation: Nigeria is classified as a high-tuberculosis(TB)-burden country, with an estimated 361,000 new cases reported in 2023. The country has a TB prevalence of 219 per 100,000 population. The global supply chain shortage of Rifampicin, a key component of drug-sensitive treatment regimens emerged, driven by scarcity of the active ingredient and supply chain interruptions emerged in early 2024, threatened TB control efforts in Nigeria.
Intervention or response: At the onset of the TB medicine shortages, the National Tuberculosis and Leprosy Control Programme (NTBLCP) swiftly engaged key stakeholders including implementing-partners, donor agencies, and patient advocacy groups to communicate the impending crisis. This early engagement helped prepare healthcare-providers and inform patients about potential treatment disruptions. In response, an emergency Standard Operating Procedure (SOP) for TB case management was developed and rolled out.
A series of coordinated strategies were implemented, including a comprehensive analysis of Logistics Management Information System (LMIS) to guide the redistribution of anti-TB medicines from overstocked, low-burden sites to high-burden facilities. To manage less frequent medicine shipments, the distribution cycle was shortened from quarterly to monthly.
Emergency logistics capacity was increased with the Global Fund's procurement of 37 Toyota-Hilux vehicles and over 1,500 motorbikes, enabling swift medicine delivery and interfacility transfers. Simultaneously, the clinical team ensured treatment continuity by identifying and line-listing eligible new clients, initiating them on therapy as soon as medicines became available.
Results/Impact: These emergency supply chain management strategies ensured that patient enrollment increased from over 361,000 in 2023 to 405,324 in 2024; this represents a 10.8% increase in patient enrollment despite acute medicine shortages.
Conclusions: Through these strategic interventions, NTBLCP successfully navigated the global shortage of first-line anti-TB medicines, minimizing disruptions in treatment services and maintaining continuous care for TB patients. This highlights the importance of early communication, adaptive logistics, data-driven decision-making, and international collaboration in maintaining essential medicine supply chains.

EP56-1241-21 Translating evidence into policy: A mixed-methods approach to guideline development for differentiated TB care in India

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Background and challenges to implementation: India accounts for 27% of the global tuberculosis (TB) burden—the highest worldwide. Despite progress under the National Tuberculosis Elimination Programme(NTEP), TB-related mortality remains high. To accelerate progress toward the End TB targets, a differentiated care model responsive to both clinical and social vulnerabilities was urgently needed.
Intervention or response: A sequential exploratory mixed-methods approach guided the development of the 2025 Differentiated TB Care guidelines. The process included desk review to identify models of differentiated care, analysis of programmatic data on TB Deaths, followed by qualitative interviews with stakeholders to capture priorities for patient-centered care. These insights shaped a quantitative analysis to identify high-risk groups. Triangulated findings informed the design of a tiered care framework, outlining level-specific roles for triaging, referral, and follow-up.
Results/Impact: This first-of-its-kind global guidance institutionalizes a patient-centered, risk-stratified model to reduce TB mortality. Drawing insights from various differentiated TB care projects in the country including Tamil Nadu KET (TN-KET), it introduces early triaging

by frontline workers, decentralizing critical care to the community level. Evidence from national data shows that nearly 50% of adults with TB are undernourished, and 25% face severe undernutrition (BMI <14 kg/m²)—a key predictor of early mortality. To address this, the model incorporates AI-based risk prediction(PATO), structured clinical assessments, and risk-informed referral pathways. The inclusion of TB Social Autopsy (TBSA) further supports systemic learning by identifying barriers contributing to TB-related deaths. With 70% of TB deaths occurring early—half within the first two weeks of treatment—this framework enables timely identification and care for vulnerable patients, aiming to reduce preventable mortality and improve outcomes.

Conclusions: The Differentiated TB Care guidelines mark a strategic, evidence-informed shift in TB management in India. By integrating clinical, social, and system-level interventions into NTEP, this scalable, equity-driven model enhances responsiveness, reduces mortality, and offers a replicable blueprint for other high-burden settings worldwide.

EP56-1242-21 What happens when people with drug-resistant TB are not supported by the community? A survival analysis in Indonesia

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Background and challenges to implementation: iLTFU/LTFU is one of the challenges to the successful treatment of DRTB patients. Community assistance interventions can decrease the ILTFU/LRTFU during the treatment period. Consortium Penabulu-STPI of Global Fund funding determined the probability of iLTFU/LTFU survival of DRTB patients during the treatment period in community-assisted and unassisted settings.

Intervention or response: DRTB patients are assistance by patient supporter during the treatment period until completion/cured. Revisit is conducted 2-3 times a month and provided enabler funds. This study was retrospective cohort through secondary data analysis of interoperability data from the National TB Information System (SITB) to the Community Information System (SITK-RO) who were diagnosed and started treatment between January and December 2023 from 190 districts/cities in 30 provinces. The Kaplan-Meier survival analysis method was conducted with a log-rank test and a Cox regression proportional hazard. Data were analyzed using SPSS IBM statistic 20 software and STATA version 16.

Results/Impact: There were 2,249 DRTB patients met the inclusion criteria with 238 (12%) patients iLTFU/LTFU of 1,974 community-assisted patients and 78 (28%) patients iLTFU/LTFU of 275 unassisted patients. The cumulative survival probability of community-assisted patients was 77%, while the probability in unassisted patients was only 32%. More than 50% of community-assisted DRTB patients survived iLTFU/LTFU even up to year 3, while unassisted patients only survived in the first year.

There was a statistically significant difference between the cumulative survival probability of community-assisted and unassisted DRTB patients (p=<0.001). Unassisted patients are more likely to iLTFU/LTFU compared to community-assisted patients (HR 3.5; 95% CI 2.731-4.567).

Conclusions: Community assistance significantly increases the survival probability of DRTB patients to complete treatment and reduces the risk for iLTFU/LTFU during the treatment period compared to patients who are not assisted by the community. Strengthening community support is essential for improving adherence and ensuring treatment success among DRTB patients.

EP56-1243-21 Accelerated BPaLM scale-up in high burden multi-drug-resistant/rifampicin-resistant TB setting: A mixed methods study on health-system strengthening through capacity building in India

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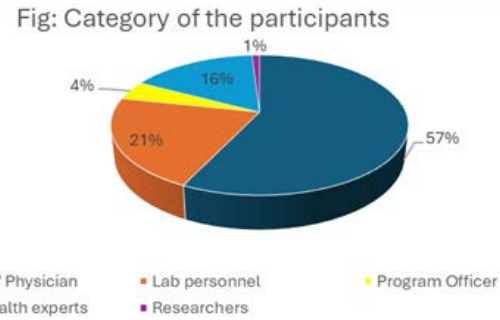
Background: India has 26% of the global Multi-Drug/Rifampicin Resistant Tuberculosis (MDR/RR-TB), posing significant challenges in favourable treatment outcomes. India declared policy to roll out countrywide implementation of BPaLM regimen for management of DRTB cases.

This study evaluates the impact of a nationwide, rapid capacity-building initiative designed to accelerate the state wise scale-up of the BPaLM regimen, as a game-changer - across India's complex health system.

Design/Methods: A national and series of regional workshops were conducted over 1.5-month, targeting a multidisciplinary audience including clinicians, laboratory personnel, supply chain managers, public health technocrats, and administrators. The workshops had well-planned agenda focusing global and country evidence, focusing on guideline dissemination, complex diagnostic challenges,

integrated algorithm, implementation strategies, interactive case-scenario-based discussions. A mixed methods design was used to assess the impact. Quantitative data were collected through pre- and post-training assessments, while qualitative data from semi-structured interviews (conducted three months post-training) explored implementation enablers and barriers. Descriptive statistics and thematic analysis were applied.
Results: A total of 525 master trainer were trained with post-training knowledge increasing by 65%.

These trainers along with program officers enabled cascade trainings in 20 out of 26 states/UTs, leading to BPaLM initiation. Qualitative findings highlighted improved interdisciplinary coordination, enhanced clinical confidence, and effective translation of guidance into practice.
Direct engagement with experts and case-based discussions were cited as key enablers. Identified challenges included variable readiness across states, logistic challenges and the need for ongoing mentoring.
Background and challenges to implementation: India has 26% of the global Multi-Drug/ Rifampicin Resistant Tuberculosis (MDR/RR-TB), posing significant challenges in favourable treatment outcomes. India declared policy to roll out countrywide implementation of BPaLM regimen for management of DRTB cases. This study evaluates the impact of a nationwide, rapid capacity-building initiative designed to accelerate the state wise scale-up of the BPaLM regimen, as a game-changer - across India's complex health system.
Intervention or response: A national and series of regional workshops were conducted over 1.5-month, targeting a multidisciplinary audience including clinicians, laboratory personnel, supply chain managers, public health technocrats, and administrators. The workshops had well-planned agenda focusing global and country evidence, focusing on guideline dissemination, complex diagnostic challenges, integrated algorithm, implementation strategies, interactive case-scenario-based discussions. A mixed methods design was used to assess the impact. Quantitative data were collected through pre- and post-training assessments, while qualitative data from semi-structured interviews (conducted three months post-training) explored implementation enablers and barriers. Descriptive statistics and thematic analysis were applied.
Results/Impact: A total of 525 master trainer were trained with post-training knowledge increasing by 65%.



These trainers along with program officers enabled cascade trainings in 20 out of 26 states/UTs, leading to BPaLM initiation. Qualitative findings highlighted improved interdisciplinary coordination, enhanced clinical confidence, and effective translation of guidance into practice. Direct engagement with experts and case-based discussions were cited as key enablers. Identified challenges included variable readiness across states, logistic challenges and the need for ongoing mentoring.
Conclusions: This nationwide initiative, featuring direct interaction with guideline developers and fostering multidisciplinary collaboration across laboratory, supply chain, and public-private sectors, effectively drove BPaLM implementation in India, highlighting the critical role of targeted training and expert engagement in rapid DR-TB scale-up.

EP56-1244-21 Social protection and TB: Policy production before, during, and after the COVID-19 pandemic in Rio de Janeiro, Brazil

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Background: The COVID-19 pandemic disrupted health and social systems globally, prompting emergency responses and policy adaptations. However, its specific impact on the formulation of TB-related social protection policies remains under-investigated. This study examines the annual trend in municipal normative document production concerning social protection and tuberculosis in the state of Rio de Janeiro, Brazil, from 2014 to 2024.

Design/Methods: A documentary analysis was conducted using 75 normative documents with valid publication dates, identified from municipal databases. Documents were classified by year and organized into a time series to visualize trends across three periods: pre-pandemic (2014–2019), pandemic (2020–2022), and post-pandemic (2023–2024). The analysis focused on changes in volume and timing of social protection policies referencing TB or related vulnerabilities.
Results: There was a significant increase in normative document production during the pandemic period, with a peak in 2021. This suggests that emergency contexts can catalyze intersectoral policy action. The years 2014 to 2018 showed consistently low levels of normative activity, indicating limited policy engagement in TB-related social protection during stable periods. In contrast, a notable decline in new policies occurred in 2023 and 2024, signaling a potential risk of discontinuity in social support actions related to TB.

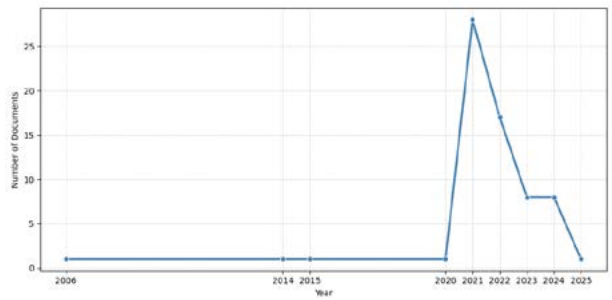

Figure 1 - Total Number of TB-Related Social Policy Documents Published per Year (2014–2024).

Conclusions: The COVID-19 pandemic functioned as a policy accelerator, driving the rapid creation of social protection norms. However, the post-pandemic decline underscores the fragility of emergency-driven initiatives and the lack of institutionalization of long-term policies. Strengthening the integration of social protection into TB control strategies requires the transition from reactive to permanent, structured policy responses. Ensuring continuity beyond crises is critical to address social determinants and reduce TB vulnerability sustainably.

EP57 Rapid diagnostic and resistance testing

EP57-1245-21 Validating proficiency testing panels for Xpert® MTB/XDR assay using CDC's DTS technology for EQA PT program

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Background: Following WHO's 2021 endorsement, the Xpert® MTB/XDR assay has been widely adopted for detecting drug-resistant tuberculosis (DR-TB). The assay is a reflex test to detect resistance to fluoroquinolones (FLQ), isoniazid (INH), ethionamide (ETH) and second-line injectables (SLI).
However, unlike other molecular tests, currently no External Quality Assurance (EQA) Proficiency Testing (PT) program exists for this assay.
Indian Council of Medical Research-National Institute for Research in Tuberculosis (ICMR-NIRT), Chennai, India with support from FIND, validated PT panels using CDC's Dried Tube Specimen (DTS) technology to address this gap.
Design/Methods: Seven well characterized *M.tb* isolates were selected, sub-cultured and chemically inactivated in July' 24. For selection, before inactivation, *M.tb* quantification was done by checking Growth Units (GU) in liquid culture (LC) and by testing on Xpert® MTB/Rif.
Non-viability was confirmed by sub-culturing isolates in LC for 84 days in Oct'2024. Inactivated stocks were stored at 4^0C.
Validation criteria for *M.tb* detection includes:
a. Quantification within medium to low range,
b. Standard deviation within 3 and;
c. Coefficient of variation within 10 for Probe A Ct values on Xpert® MTB/Rif assay as quantification results are not available on MTB/XDR assay.
For drug resistance, detection of resistance to FQs, IHN, SLID and ETO, on Xpert® MTB/XDR assay against known results, was considered as validation criteria.
Since, diluted stock gave "very low" results on MTB/Rif assay, validation of panels was done using direct stock for five aliquots of each strain on both assays in Oct'24.
Results: Test results on five aliquots of seven strains confirmed that the isolates met the validation criteria for detection of *M.tb* and drug resistance profiles (Figure 1).
Conclusions: PT panels for Xpert® MTB/XDR assay can be successfully prepared using CDC's DTS technology, enabling the introduction of EQA programs to ensure testing quality.

Figure 1: Validation of EQA PT panel using Xpert® MTB/Rif and Xpert® MTB/XDR Assay

#	Expected results of the strain	GeneXpert MTB/Rif assay (Quantitative results)				Xpert MTB/XDR assay (Qualitative results)	Validation
		Result	MTB Probe A Ct value				
			Mean	SD	CV		
Isolate 1	MTB Detected Resistance Detected (RIF, INH, AMK, KAN, CAP) Resistance not detected (FLQ, ETH)	MTB Detected (Low) Resistance Detected (RIF)	27.10	0.96	4%	MTB Detected Resistance Detected (INH, AMK, KAN, CAP) Resistance not detected (FLQ, ETH)	Successful
Isolate 2	MTB Detected Resistance Detected (RIF, FLQ) Resistance not detected (INH, AMK, KAN, CAP, ETH)	MTB Detected (Low) Resistance Detected (RIF)	24.27	0.42	2%	MTB Detected Resistance Detected (FLQ) Resistance not detected (INH, AMK, KAN, CAP, ETH)	Successful
Isolate 3	MTB Detected (Medium) Resistance Detected (RIF, INH, FLQ, AMK, KAN, CAP, ETH)	MTB Detected (Low) Resistance Detected (RIF)	25.87	0.30	2%	MTB Detected (Medium) Resistance Detected (INH, FLQ, AMK, KAN, CAP, ETH)	Successful
Isolate 4	MTB Detected (Medium) Resistance Detected (RIF, INH, FLQ) Resistance not detected (AMK, KAN, CAP, ETH)	MTB Detected (Low) Resistance Detected (RIF)	25.30	1.30	5%	Mtb detected Resistance Detected (INH, FLQ) Resistance not detected (AMK, KAN, CAP, ETH)	Successful
Isolate 5	MTB Detected (Medium) Resistance Detected (RIF, INH) Resistance not detected (FLQ, AMK, KAN, CAP, ETH)	MTB Detected (Low) Resistance Detected (RIF)	25.67	0.80	3%	Mtb detected Resistance Detected (INH) Resistance not detected (FLQ, AMK, KAN, CAP, ETH)	Successful
Isolate 6	MTB Detected (High) Resistance not detected (RIF, INH, FLQ, AMK, KAN, CAP, ETH)	MTB Detected (Medium) Resistance not Detected (RIF)	19.63	1.10	6%	Mtb detected Resistance not detected (INH, FLQ, AMK, KAN, CAP, ETH)	Successful
Isolate 7	MTB Detected (Medium) Resistance not detected (RIF, INH, FLQ, AMK, KAN, CAP, ETH)	MTB Detected (Low) Resistance not Detected (RIF)	25.07	0.60	2%	Mtb detected Resistance not detected (INH, FLQ, AMK, KAN, CAP, ETH)	Successful

Results: A total of 3,639 specimens were included in the sample for testing, of which 1,809 used SoC and 1830 SSC. Among SoC rejections, 84% (215) were due to insufficient volume, 1.6% (four) due to defective closure, and 13% (33) were salivary. In contrast, SSC rejections were primarily due to insufficient volume (71%; 65), with minimal issues from leakage (1.1%; one) and salivary content (27.5%; 25). The difference in rejection rates between SoC and SSC was statistically significant ($p < 0.001$) with 14% vs 5%.

Conclusions: The SSC significantly reduced specimen rejection rates, particularly those due to insufficient volume and leakage. Continued training is vital to sustain improved clinical practices in TB specimen collection.

EP57-1246-21 Sinapi Specimen Cups to reduce Xpert MTB/RIF testing rejection rate in Mali

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Background: In 2011, the World Health Organization (WHO) endorsed the use of GeneXpert (Xpert® MTB/RIF) for tuberculosis (TB) diagnosis and, in 2014, introduced the End Tuberculosis Strategy aiming for a 95% reduction in TB-related deaths by 2035. Mali adopted Xpert MTB/RIF in 2014 and, as of 2022, recommends it as the primary diagnostic tool for TB. However, sample rejections due to issues such as insufficient volume and container leakage have hindered effective testing. The Sinapi Specimen Cup (SSC) was developed to address these challenges by ensuring secure containment and appropriate sputum volume collection, thus improving diagnostic outcomes.

The aim of this study was to compare the current standard of care (SoC) with the SSC for TB diagnosis using Xpert MTB/RIF testing

Design/Methods: This was a cross-sectional study enrolling in 2024 suspected TB patients aged 13 and older at TB diagnosis and treatment centers in Bamako in an IRB approved protocol. Consented participants used either current SoC, or the SSC for TB diagnosis using Xpert MTB/RIF.

EP57-1247-21 Implementing Bangladesh's first EQA program for GeneXpert MTB/XDR: Ensuring quality diagnosis of drug-resistant TB

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Background: External Quality Assessment (EQA) is a key component of a robust quality assurance system designed to ensure the quality of diagnosis of drug resistance TB. National Tuberculosis Control Program (NTP) of Bangladesh has introduced the Xpert MTB/XDR assay in its Tuberculosis laboratory network in 2023. Bangladesh is the first country in the Asian region to implement EQA for the MTB/XDR Assay.

Design/Methods: In 2024, the NTP of Bangladesh launched an Xpert MTB/XDR External Quality Assessment (EQA) program in collaboration with the National Institute for Research in Tuberculosis (NIRT) in Chennai, India, and the Foundation for Innovative New Diagnostics (FIND). A total of 81 laboratories were enrolled in the program. Each EQA proficiency testing (PT) panel consisted of five labeled dried tube specimens, prepared from well-characterized Mycobacterium tuberculosis (MTB) strains, which were sent to participating laboratories.

The panel was tested according to specific instructions, and results were submitted within the designated timeframe via the EQA portal. Testing accuracy was evaluated by comparing reported results with expected outcomes, and percentage scores were assigned.

Feedback reports were provided to the laboratories, and on-site evaluations (OSE) were conducted for those laboratories that demonstrated underperformance.

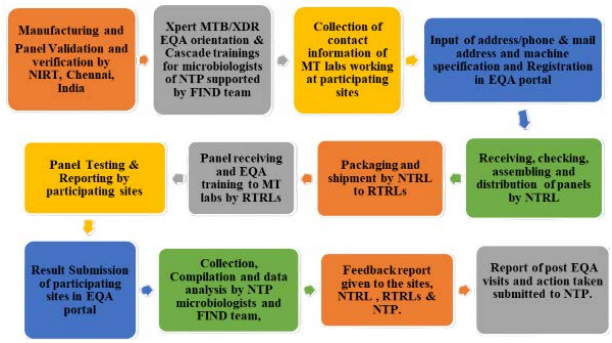

Fig: EQA implementation cascade.

Results: Among the 81 participating sites, 98.2% (80/81) achieved satisfactory results in the proficiency testing, with scores exceeding 80%. However, 1.2% (1/81) of the sites demonstrated performance below 80% in the 2024 round. Overall, the results were highly satisfactory. To enhance the quality of testing, participants with discordant results were advised to review their current procedures, identify the root causes of discrepancies, and implement corrective actions promptly to prevent unreliable test outcomes.
Conclusions: The EQA program for Xpert MTB/XDR has significantly improved the quality of drug-resistant TB diagnosis. To ensure sustained high performance across TB laboratories, it is recommended to scale up this program to all DR-TB testing sites.

EP57-1248-21 Innovo GenMax MTB-RIF/INH: A moderate-complexity automated NAAT for rapid simultaneous detection of *M. tuberculosis* complex and rifampin/isoniazid resistance

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Background: To evaluate the performance of the Innovo GenMax MTB-RIF/INH (GenMax), a moderate-complexity automated nucleic acid amplification test (NAAT), for detecting *Mycobacterium tuberculosis* complex (MTBC) and resistance to rifampin (RIF) and isoniazid (INH).
Design/Methods: Analytical sensitivity (limit of detection, LOD) was determined using serial dilutions of MTB strains. Diagnostic accuracy was assessed in clinical sputum specimens against microbiological reference standards (MRS: smear, culture, or Xpert MTB/RIF) and phenotypic drug susceptibility testing (DST). Discordant results were resolved by sequencing (IS6110, rpoB, katG, inhA, ahpC) and follow-up diagnosis results.
Results: GenMax demonstrated a calculated LOD of 8.8 CFU/mL (95% CI: 7.4-11.4) for MTBC, 674.1 CFU/mL (95% CI: 578.8-923.5) for RIF resistance, and 747.3 CFU/mL (95% CI: 613.7-1081.3) for INH resistance. In clinical evaluation, the sensitivity and specificity for MTBC detection were 97.52% (95% CI: 92.38–99.36) and 93.65% (95% CI: 88.91–96.53), respectively. For RIF and INH resistance, sensitivities were 88.46% (95% CI: 68.72–96.97) and 85.19% (95% CI: 65.39–95.14), with specificity of 92.42% (95% CI: 82.50-97.18) and 94.12% (95% CI: 84.86-98.10).
Conclusions: Innovo GenMax MTB-RIF/INH is a rapid and automated assay with high sensitivity for MTBC detection, suitable for decentralized settings. While its performance for RIF/INH resistance detection is competitive with existing assays, sensitivity gaps relative to WHO targets necessitate optimization.

EP57-1249-21 Evaluation of the STANDARD M10 MTB-RIF/INH assay: A rapid solution for drug-resistant TB detection

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Background: Accurate and rapid diagnosis of tuberculosis (TB) and drug-resistant TB (DR-TB) is essential for effective disease control. The STANDARD M10 MTB-RIF/INH assay (MTB-RIF/INH) (SD Biosensor, Inc, Republic of Korea) is a molecular test designed for the simultaneous detection of *Mycobacterium tuberculosis* complex (MTBC) and resistance to rifampicin (RIF) and isoniazid (INH).
In this study, we aimed to investigate the diagnostic performance of the MTB-RIF/INH assay on sputum in a clinical setting.
Design/Methods: We consented and enrolled 86 eligible participants at the Hillbrow Community Health Centre and Yeoville Clinic in Johannesburg, South Africa. Each participant provided three sputum specimens across two visits. Specimens were transported to the laboratory at 2–8°C. Two sputum underwent routine testing using Xpert MTB/RIF Ultra (Ultra) (Cepheid, Sunnyvale, CA, USA) and Mycobacterial Growth Indicator Tube (MGIT) (Becton, Dickinson and Company, Sparks, MD, USA) culture. The third specimen was tested using the MTB-RIF/INH assay, with results compared to MGIT and phenotypic drug susceptibility testing (pDST) as the gold standard, and to Xpert MTB/XDR (Cepheid) as a comparator for INH resistance.
Results: Valid results from 73 participants were included in the statistical analysis, with assay performance detailed in Table 1. The median age was 40 years (54% male), 48% were HIV-positive and 13% bacteriologically confirmed

using MGIT. RIF and INH resistance profiles were available for six specimens. Although no resistant cases were detected, the MTB-RIF/INH assay demonstrated 100% agreement with Ultra for RIF, Xpert MTB/XDR for INH, and pDST for both RIF and INH.

Assay	Sensitivity (95% CI)	n/N	Specificity (95% CI)	n/N	Unsuccessful test rate
Xpert Ultra	100% (71.5%-100%)	11/11	95.2% (86.5%-99.0%)	59/62	1/86 (1%)
STANDARD M10 MTB-RIH/INH	90.9% (58.7%-99.7%)	10/11	98.4% (91.7%-99.9%)	61/62	0/86 (0%)

Table 1: Assay performance compared with liquid culture.

Conclusions: Preliminary results on the STANDARD M10 MTB-RIF/INH assay demonstrated high diagnostic accuracy. With its ability to detect resistance RIF and INH in a single test, the assay has the potential to enhance treatment decision-making, reduce diagnostic delays, and support global efforts in TB control and resistance surveillance.

EP57-1250-21 Real-time monitoring of performance of GeneXpert machines through a locally developed web-based application

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Background and challenges to implementation: National TB Program in Nepal has considered GeneXpert MTB/RIF testing as primary tool for diagnosis of Tuberculosis among presumptive TB cases since 2019. The program has installed 133 GeneXpert machines across 117 sites. There were challenges in monitoring functionality of these machines on real-time basis leading to delay in maintenance/calibration and low utilization.
Intervention or response: GXMIS, web-based connectivity application, was developed by national IT experts following Health Level Seven (HL7) protocol: international standards for transfer of clinical and administrative data between software applications used by various healthcare providers. GeneXpert machines were configured through onsite/remote desktop support and networked to the GXMIS system.
Through this application, functionality of each module of a machine is monitored. This feature monitored and analyzed errors, positivity rate, Rifampicin Resistance rate and utilization at the central and provincial level. The GeneXpert sites were able to report any issues related to functionality of the machines and modules by raising tickets in the system. GeneXpert service engineers responded to the issues visiting to the sites or through remote assistance at the earliest possible. A total of USD 8000 was spent to develop the system.
Results/Impact: Out of 117 GeneXpert sites under the NTP, 112 are enrolled in the GXMIS system. In 2024, 125,796 tests, 5833 errors, 683 invalid tests, MTB positivity rate of 13%, RR rate of 3% and the utilization rate 28.4% were reported in the system nationally. 88 issues were reported by arising tickets and service engineers responded to 88 of them by physical and virtual means. The functionality of the GeneXpert machine was higher in 2024 (avg. 95%) compared to that in 2021 (avg 85%).
Conclusions: GXMIS is low-cost web-based application for real-time monitoring of the performance of the GeneXpert machines, to improve utilization of the machines through real-time reporting of functionality issues and immediate response from service engineers.

EP57-1251-21 Operational feasibility of 'TB Concentration & Transport' and 'TB DNA Extraction' kits for bio-safe dry sputum transport for drug resistance detection using Line Probe Assay

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Background: We recently described the utility of 'TB Concentration & Transport' kit for bio-safe, ambient-temperature transport of dried-sputum on *Trans*-Filter, and 'TB DNA Extraction' kit for DNA extraction from *Trans*-Filter for the early diagnosis of drug-resistant Tuberculosis (TB). This study aimed to assess the feasibility and compatibility of these kits with Line Probe Assay (LPA) under National Tuberculosis Elimination Programme (NTEP) settings.
Design/Methods: Presumptive pulmonary TB/MDR-TB/XDR-TB patients (n=8491) who attended Designated Microscopy Centres (DMCs, n=13) under National Reference Laboratories (NRLs) at Bhopal, New Delhi, Chennai and Bhubaneswar were screened by smear microscopy. The performance of *Trans*-Filter-extracted-DNA-based-LPA (Kit-LPA) was assessed against Direct-LPA on smear-positive sputum (n=681) and feedback was obtained from Scientists (n=10) and Laboratory techni-

cians (n=42) regarding logistics, kit-usage, training, and troubleshooting. A scoring questionnaire was used to assess (i) 'Transport kit' *vs*. conventional sputum transport and (ii) 'TB DNA Extraction' kit *vs*. Hain's GenoLyse kit (statistical significance of the scores was calculated using paired t-test).
Results: Kit-LPA showed a sensitivity and specificity in the range of 89-96% and 99-100%, respectively, for RIF and INH resistance detection and was comparable to Direct-LPA [concordance=99-100% (κ value=0.94-0.97)]. Overall scores indicated that (i) sputum transport on *Trans*-Filters was more convenient as compared to conventional sputum transport (p<0.0001) and (ii) *Trans*-Filter extracted DNA was easily amalgamated with LPA testing for MDR-TB detection.
Conclusions: These findings provide evidence for incorporation of these kits into the NTEP. Their use can facilitate sputum-transport from DMCs to NRLs and provide "Universal-DST" to TB subjects residing in remote areas.

EP57-1252-21 Drug-resistance characterisation of *M. tuberculosis* using ONT in Mongolia

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Background and challenges to implementation: Mongolia is among the 30 countries with a high TB burden and is also categorized as one of the countries with the highest MDR-TB burden. RR and MDR-TB rates were 7.2% in new cases and 8.2% in previously treated cases. To address the growing threat of drug-resistant TB, there is a critical need for advanced diagnostic tools. Oxford Nanopore Technologies (ONT) offers significant potential for early detection, comprehensive drug resistance profiling, and optimized treatment strategies.
This study implemented ONT sequencing at the National TB Reference Laboratory in Mongolia to evaluate its accuracy and feasibility by comparing genomic drug susceptibility testing (gDST) with phenotypic DST (pDST).
Intervention or response: We selected *M. tuberculosis* isolates from our culture bank and performed subcultures for next-generation sequencing (NGS) using the GridION platform. As of 2024, 553 isolates were sequenced, with 115 compared to drug susceptibility testing (pDST). Sequencing data were processed and quality-checked using the EPI2ME platform.
Results/Impact: Comparison of pDST and gDST showed high concordance rates for first-line drugs: 99% for isoniazid and rifampicin, and 95% and 96% for ethambutol and streptomycin, respectively. Among the 21 samples analyzed for second-line drugs, a comparison between pDST and NGS revealed 100% concordance for kanamycin (KM), amikacin (AM), and ofloxacin (OFX) and 95% for capreomycin (CPM). A comparison of new TB drugs in 27 samples showed high concordance rates: 100% for linezolid (LZD), delamanid (DLM), and clofazimine (CFZ), with bedaquiline (BDQ) slightly lower at 96%. These results demonstrate strong agreement between pDST and NGS-based gDST.
Conclusions: ONT-based sequencing proved highly reliable and accurate for detecting *M. tuberculosis* drug resistance. This approach offers a promising alternative to traditional methods, enabling faster, comprehensive DST results to guide effective treatment decisions. The next step will be to evaluate targeted NGS and maintain a stable and affordable supply of reagents and licenses.

EP57-1253-21 Equivalency for HIV: Tongue swabs offer robust alternative to sputum testing for PLHIV

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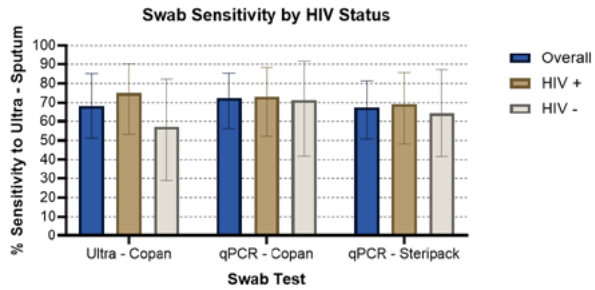
Background: *Mycobacterium tuberculosis* (MTB) diagnosis requires adequate sputum production which can be difficult, especially for people living with HIV (PLHIV). To diagnose MTB in PLHIV, an easy-to-collect sample type like tongue swabs is an appealing alternative. Historically, tongue swab tests have shown lower sensitivity among PLHIV because of a lower bacillary load; however, these populations still need sensitive, accessible diagnostics. MTB tongue swab tests with equivalent sensitivity to sputum among PLHIV would expand diagnostic options for PLHIV.
Design/Methods: Tongue swabs were collected using a 30-second dry collection protocol on two Copan FLOQSwabs and one Steripack XpressCollect from 288 people living in South Africa with presumed TB. Then, sputum samples were collected from the same individuals and

tested by Xpert Ultra (Ultra) to use as a reference (HIV-: 40% high, 7% medium, 27% low, 20% very low, 7% trace; HIV+: 23% high, 31% medium, 31% low, 4% very low, 12% trace). Copan swabs were tested on both Ultra and qPCR, and Steripack swabs were tested only on qPCR.
Results: Using sputum tested on Ultra as the reference, sensitivity of Copan swabs tested on Ultra was 75.0% (18/24) in PLHIV and 57.1% (8/14) in those without HIV. Sensitivity of Copan swabs tested on qPCR was 73.1% (19/26) in PLHIV and 71.4% (10/14) in those without HIV, respectively. Sensitivity of Steripack swabs tested on qPCR was 69.2% (18/26) in PLHIV and 64.3% (9/14) in those without HIV, respectively.



Conclusions: Copan swabs tested on qPCR had similar detection regardless of HIV status, with comparable sensitivity to sputum on Ultra in PLHIV across all swab tests. Tongue swab collection and qPCR protocols with equivalent sensitivity regardless of HIV status present a new diagnostic opportunity for PLHIV and may continue to improve with further optimization.

EP58 Outcomes of drug-resistant TB

EP58-1255-21 Predicting delayed culture conversion in people receiving treatment for rifampicin-resistant TB

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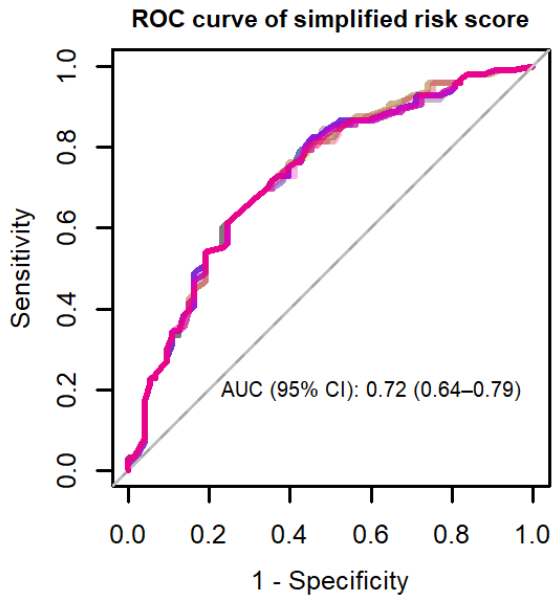
Background: Rifampicin-resistant tuberculosis (RR-TB) remains a global burden, with only 65% of treated patients achieving successful treatment outcomes. Delayed culture conversion is a strong predictor of poor treatment response. We aimed to develop a simplified risk score to predict delayed culture conversion based on baseline patient characteristics.
Design/Methods: The source cohort was the SMARTT trial, which enrolled adults with uncomplicated RR-TB in South Africa. Delayed culture conversion was defined as failure to achieve at least two consecutive negative cultures within one month of treatment initiation. Candidate predictors were selected based on clinical relevance, ease of interpretation, and routine availability. Missing data were handled using multiple imputation. Logistic regression analyses were performed to build the prediction model. A simplified risk score was constructed based on the model's β coefficients. The performance of the prediction model and simplified risk score was assessed via discrimination (area under the receiver operating characteristic curve, AUC-ROC) and calibration (calibration plots and Hosmer-Lemeshow test). The model was internally validated using bootstrapping, and the optimal cut-off point was determined using the Youden Index.
Results: A total of 56.8% (96 out of 169) of patients experienced delayed culture conversion. The final prediction model included mycobacterial load, malnutrition, anemia, impact on usual activity, prior TB treatment, and age. The model's AUC was 0.732 (95% CI: 0.648–0.802), with the optimism-corrected AUC of 0.693 (95% CI: 0.666–0.815). The simplified risk score, ranging from 0 to 7, had an AUC of 0.718 (95% CI: 0.637–0.788). Risk probability of 0.554 was the optimal cut-off point. Calibration assessments indicated no significant deviation between predicted and observed probabilities.



Conclusions: The simplified risk score, with satisfactory predictive performance, can serve as a tool for clinicians to estimate the risk of delayed culture conversion in RR-TB patients, facilitating early risk stratification and individualized management.

EP58-1256-21 Treatment outcomes of rifampicin-resistant TB under programmatic conditions in Vietnam in 2021 - 2022

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Background: Vietnam is a high tuberculosis (TB) and rifampicin-resistant TB (RR-TB) burden country. New RR-TB regimens keep being recommended in recent years and more evidence about nationwide implementation of different RR-TB regimens is essential to inform treatment guidelines in Vietnam.
Design/Methods: A retrospective cohort study of all RR-TB patients treated nationwide in Vietnam from 2021 to 2022. Short treatment regimens (STR) were 9-11-month standardized 7-drug regimens with either bedaquiline (BDQ/STR) or an injectable drug (inj/STR), and a modified 9-11-month 5-drug regimen (mod/STR). Long regimens were 18-20-month individualized regimens for fluoroquinolone-susceptible RR-TB (RR-TB/long) or fluoroquinolone-resistant RR-TB (pre-XDR-TB/long). With logistic regression we estimated predictors of unfavorable outcome.
Results: Of 4814 RR-TB patients, 71.2% had treatment success. Treatment failure, death, lost-to-follow-up (LTFU) and not evaluated accounted for 3.6%, 7.8%, 13.3% and 4.2%, respectively. Long regimens had higher mortality (>10%) and LTFU (>15%). Among STR, inj/STR had the lowest success rate (73.3%) in comparison to BDQ/STR (76.7%) and mod/STR (78.9%), the difference was significant after adjusting for confounding factors. LTFU rate is still high (>11%) in both BDQ/STR and inj/STR. Treatment with injectable based short regimen, long regimens, re-treatment after LTFU and being male are predictors of unfavorable RR-TB treatment outcomes.

	Total N	Treatment outcome		Odds ratio (OR)	[95%CI]	adusted OR	[95%CI]
		Favorable# N (%)	Unfavorable$ N (%)				
Regimen							
BDQ/STR	1603	1221 (76.2)	382 (23.8)	1.00		1.00	
inj/STR	1441	1035 (71.8)	406 (28.2)	1.60***	[1.37,1.86]	1.58***	[1.35,1.84]
mod/STR	144	114 (79.2)	30 (20.8)	0.84	[0.56,1.27]	0.78	[0.51,1.18]
RR-TB/long	1370	882 (64.4)	488 (35.6)	2.08***	[1.78,2.42]	1.86***	[1.59,2.18]
pre-XDR-TB/long	256	174 (68.0)	82 (32.0)	1.66***	[1.26,2.18]	1.49**	[1.13,1.98]
Total	4814	3426 (71.2)	1388 (28.8)				

*Legend: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*
 # Favorable: cured, completed
$ Unfavorable: failure, death, lost-to-follow-up, not evaluated

Conclusions: During the transition from long to short regimens, nationwide data showed 71.2% RR-TB treatment success in Vietnam. The wider use of short regimens and addressing LTFU can improve outcomes. More robust and better managed long regimens are needed for those not eligible for any STR.

EP58-1257-21 Comparative analysis of bedaquiline-based treatment outcomes in peope who are HIV-positive and HIV-negative with rifampicin-resistant TB in Gauteng Province, South Africa

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Background: The co-epidemic of Human Immunodeficiency Virus (HIV) and tuberculosis (TB) remains a critical public health challenge with a 58% co-infection rate in South Africa, further exacerbated by drug-resistant TB (DR-TB), which has a global treatment success rate of 60%. Bedaquiline has shown promise in improving DR-TB outcomes, however its efficacy in persons living with HIV (PLWH) remains understudied.
This study aims to compare bedaquiline-based treatment outcomes by HIV status.
Design/Methods: We conducted a retrospective cohort analysis of rifampicin-resistant TB patients initiating bedaquiline-based regimens at 4 districts in Gauteng province, South Africa between February 2023- March 2025. Data were extracted from clinical records and laboratory reports. Analyses included descriptive statistics, logistic regression, and Kaplan-Meier curves.
Results: Preliminary analysis included 433 participants (333 HIV+, 100 HIV−), with 97% of HIV+ patients on antiretroviral therapy (ART). PLWH were older than those who were HIV- (median age 38 vs. 35; p=0.01). Persons living with and without HIV did not differ in gender (male: 62.2% HIV+ vs. 68.0% HIV−; p=0.29), underweight body mass index (BMI) (39.6% HIV+ vs. 37.0% HIV−; p=0.89) or treatment regimen (BPaL: 79% HIV+ vs. 82% HIV−; p=0.72).
The median time to culture conversion did not differ, (57 days HIV+ vs. 58 days HIV−; p=0.72) and culture conversion rates at 2 months (51.9% vs. 52.7%; p=0.90), and 6-months (93.4% vs. 96.0%; p=0.42) were similar. PLWH had higher unfavourable outcomes (death, loss to follow-up, treatment failure), (37.2% vs. 26.0%; p=0.04), with 1.65-fold increased odds of unfavourable outcomes after adjusting for age and gender (95% Confidence Interval:1.01–2.72; p=0.046).
Conclusions: Despite comparable TB treatment efficacy (culture conversion rates), and high ART coverage, systemic factors disproportionately affect PLWH, resulting in higher unfavourable DR-TB outcomes. This underscores the urgent need for integrated care models and tailored bedaquiline-based strategies to address inequities in this population.

EP58-1258-21 Outcomes of short-course regimens in the treatment of drug-resistant TB in people with TB & HIV, TB & hepatitis, TB & HIV & hepatitis, and TB in Kazakhstan

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Background: The implementation of short-course regimens (mSTR) for drug-resistant tuberculosis (DR-TB) in patients with coexisting conditions such as HIV and viral hepatitis B, C presents unique challenges.
This study evaluates treatment outcomes and adverse events among different patient cohorts receiving mSTR in Kazakhstan.
Design/Methods: A total of 1945 patients (1320 males, 67.9%;) underwent treatment with one of the following regimens:
- Bdq Lzd Cfz Lfx Cs – 1873 patients (96.3%)
- Bdq Lzd Cfz Lfx Dlm – 72 patients (3.7%)

All patients with HIV received antiretroviral therapy (ART), whereas patients with viral hepatitis B, C did not receive antiviral therapy, potentially impacting observed outcomes.
Results:
- **TB+HIV (n=49, 2.5% of total cohort):**
  Treatment success: 82.6%
  Death: 2.2%
  Failure: 15.2%
  Adverse events: 63.3%
- **TB+Hepatitis (n=88, 4.5% of total cohort):**
  Treatment success: 81.2%
  Death: 3.5%
  Failure: 9.4%
  Adverse events: 47.7%
- **TB+HIV+Hepatitis (n=44, 2.3% of total cohort):**
  Treatment success: 64.1%
  Death: 7.7%
  Failure: 12.8%
  Adverse events: 88.6%
- **TB without coinfections (n=1,764, 90.7% of total cohort):**
  Treatment success: 85.5%
  Death: 3.3%
  Failure: 9.4%
  Adverse events: 34.8%

Conclusions:
- TB-only patients had the highest success rate (85.5%), followed by TB+HIV (82.6%), TB+Hepatitis (81.2%), and TB+HIV+Hepatitis (64.1%).
- The highest mortality was in TB+HIV+Hepatitis (7.7%).
- Adverse events were most frequent in TB+HIV+Hepatitis (88.6%).

Short-course regimens are effective for RR/MDR-TB, especially in patients without co-infections. Co-infected patients had lower success rates and higher adverse events, highlighting the need for tailored approaches and antiviral therapy in TB+Hepatitis cases.

EP58-1259-21 PZA resistance and treatment outcome among people with drug-resistant TB at Respiratory Referral Hospital in Indonesia in 2020-2024

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Background: Indonesia is in the third rank of DR-TB (Drug-resistant Tuberculosis) burden globally in 2023, accounting for 7,4% of DR-TB worldwide. Recommended treatment for both DR-TB and DS-TB (Drug-sensitive Tuberculosis) includes PZA (pyrazinamide) in the treatment regimen, but treatment for DR-TB patients was longer compared to DS-TB. This leads to a lower success rate of DR-TB treatment in Indonesia. This study aims to determine the prevalence of PZA resistance and assess the factors associated with treatment outcomes among DR-TB patients at Persahabatan National Respiratory Referral Hospital Jakarta in 2020-2024.
Design/Methods: This is a single-center cross-sectional study utilizing data from the TB Information System (Sistem Informasi Tuberkulosis, SITB). The proportion of PZA resistance among DR-TB cases was calculated, and factors associated with treatment outcomes were analyzed for each eligible individual. Bivariate analysis was conducted using the chi-square test, with variables showing $P \leq 0.25$ included in the multivariate analysis. Cox regression was performed to identify factors associated with treatment outcomes, with loss to follow-up (LtFU) as the event of interest.
Results: PZA resistance status was determined in 25.19% of patients. The prevalence of PZA resistance among TB patients was highest in 2024, reaching 40.00%. Overall, 28.82% of DR-TB patients were found to be resistant to PZA. After adjusting with confounding variables, sex (aHR 3.56, 95% CI 1.62-7.79) was independently associated with an increased risk of LtFU, whereas MDR-TB diagnosis (aHR 0.36, 95% CI 0.15-0.85) was associated with a lower risk of LtFU.
Conclusions: The high prevalence of PZA resistance underscores the need for strengthened treatment strategies to ensure treatment adherence among DR-TB patients, particularly those with PZA resistance. The association between sex and MDR-TB suggests that gender plays a role in treatment adherence.
Enhanced patient support systems and stricter follow-up protocols for MDR-TB patients may contribute to higher treatment completion rates compared to other TB diagnoses.

EP58-1260-21 Treatment success rate of people with drug-resistant TB on BPaL regimen in the Democratic Republic of Congo

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Background: In May 2022, The World Health Organization (WHO) has recommended a combination of Bedaquillin, Pretomanid and Linezolid (BPaL) regimen for the treatment of patients with multidrug-resistant tuberculosis (MDR-TB). The Democratic Republic of Congo (DRC), one of the 3 countries in the WHO African Region with the highest burden of MDR-TB, has implemented the BPaL regimen for the treatment of rifampicin-resistant (RR) tuberculosis patients.
Design/Methods: We conducted a document review and dissemination of the treatment guidelines, followed by a training of health professionals involved with MDR-TB and implementation of the BPaL regimen in one site Centre of Excellence Action Damien for the management of MDR-TB patients in Kinshasa province. Were included, all rifampicin resistant TB patients with documented resistant to fluoroquinolone enrolled in the BPaL regimen from May 2022 to December 2024.

Results: A total of 47 patients were enrolled and started the BPaL regimen. At the end of 6-month treatment follow-up, 23 (49%) completed the treatment; 21 (45%) were confirmed cured making a treatment success rate of 94%; 2 (4%) patients were lost-to-follow-up, and 1 (2%) death was reported.
Observed side effects included peripheral neuropathy [8(18%)], skin rash [8(18%)], severe anaemia [3(6%)] and hyper-creatininemia [1(2%)].
Background and challenges to implementation: In May 2022, The World Health Organization (WHO) has recommended a combination of Bedaquillin, Pretomanid and Linezolid (BPaL) regimen for the treatment of patients with multidrug-resistant tuberculosis (MDR-TB).
The Democratic Republic of Congo (DRC), one of the 3 countries in the WHO African Region with the highest burden of MDR-TB, has implemented the BPaL regimen for the treatment of rifampicin-resistant (RR) tuberculosis patients.
Conclusions: The BPaL regimen offers many advantages in terms of treatment duration and compliance. It was well tolerated by patients in the study setting. To be scaled up, considerations should be the training of health professionals in identifying and managing side effects, on early management of patients presenting side effects and availability of drugs for the treatment of side effects.

EP58-1261-21 Treatment outcomes of bedaquiline-resistant TB: A retrospective and matched cohort study

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Background: Rising prevalence of bedaquiline resistance undermines benefits from this life-saving drug for rifampicin-resistant tuberculosis (RR-TB). Despite increasing awareness, patient-level outcomes for bedaquiline-resistant TB have not been well-characterised and case management poorly defined.
Design/Methods: We conducted a retrospective cohort study of bedaquiline-resistant TB with matched RR-TB controls at a TB referral hospital in South Africa. Cases included patients ≥13 years with a phenotypic bedaquiline-resistant *Mycobacterium tuberculosis* isolate identified between January 2018 and June 2023. Controls with confirmed bedaquiline-susceptible TB, matched 1:1 by culture, age and HIV status, were selected from a prospective observational study conducted during an overlapping period at the same facility. Primary outcomes included time to sputum culture conversion (SCC), a modified WHO-defined unfavourable outcome, and TB-free survival (alive, with SCC, and in care or treatment completed) through 18 months. Adjusted analyses used Cox proportional hazards models.
Results: Eighty-two patients with bedaquiline-resistant TB were included, 57/82 (70%) of whom were HIV-positive. Bedaquiline was prescribed for 72/82 (88%) and meropenem for 32/82 (39%), Figure 1. Together with bedaquiline, the most frequently prescribed drugs included clofazimine, linezolid and terizidone. Median time to SCC was 175 (IQR 100–254) days in the bedaquiline resistant cohort and 32 (IQR 30–42) days in matched controls. In analysis of the combined cohorts, bedaquiline resistance (aHR 0.03, 95% CI 0.01–0.29, p=0.003) was associated with reduced SCC when adjusted for baseline microscopy grade and baseline fluoroquinolone resistance. WHO treatment outcomes in those with bedaquiline-resistant TB were unfavourable in 54/81 (67%) patients, driven by treatment failure in 35/81 (43%). At 18 months, 43/82 (52%) cases had achieved TB-free survival; 19/82 (23%) had died, and 50/63 (80%) survivors were still on treatment.

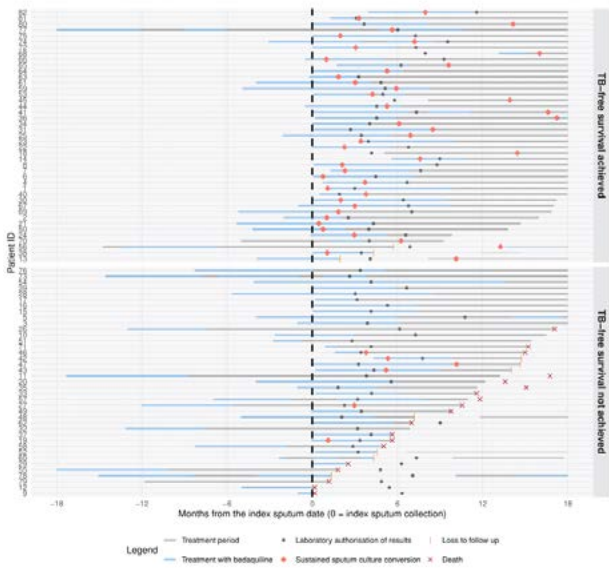

Figure 1: Treatment timeline for patients with bedaquiline-resistant tuberculosis.

Conclusions: Current treatment options for bedaquiline-resistant TB result in prolonged therapy, delayed microbiological responses, and poor clinical outcomes.

EP58-1262-21 Long-term efficacy and safety of 9-month all-oral regimens for multi-drug-resistant and pre-extensively drug-resistant TB: A multicentre, prospective cohort study in China

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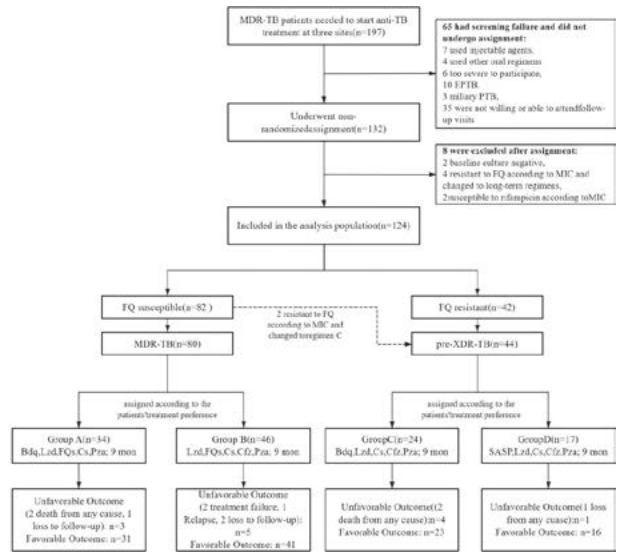
Background: Our previous study demonstrated favorable outcomes with tailored 9-month all-oral five-drug regimens for multidrug-resistant tuberculosis (MDR-TB) and pre-extensively drug-resistant tuberculosis (pre-XDR-TB) at 12 months post-treatment.
We aimed to evaluate long-term efficacy and safety through a 36-month follow-up period after treatment completion.
Design/Methods: This prospective multicenter cohort study involved MDR-TB patients receiving regimen A (bedaquiline, linezolid, moxifloxacin, cycloserine, pyrazinamide) or B (linezolid, moxifloxacin, cycloserine, clofazimine, pyrazinamide), and pre-XDR-TB patients receiving regimen C (bedaquiline, linezolid, cycloserine, clofazimine, pyrazinamide) or D (sulfasalazine, linezolid, cycloserine, clofazimine, pyrazinamide), based on drug susceptibility and affordability. The primary endpoint was unfavorable outcomes (treatment failure, relapse, death, or loss to follow-up) within 36 months post-treatment. Secondary endpoints included adverse events and overall survival.
Results: Between April 2019 and December 2024, 124 patients (median age 39.7 years [IQR 27.1–42.3]) were enrolled and analyzed. The overall favorable outcome rate was 89.5% (111/124). Favorable outcomes did not significantly differ between regimen groups for MDR-TB (A: 91.1%, 41/45 vs. B: 89.1%, 41/46; p=0.76) or pre-XDR-TB (C: 85.1%, 23/27 vs. D: 94.1%, 16/17; p=0.37). Thirteen (10.5%) patients experienced unfavorable outcomes, primarily due to death (n=6) and loss to follow-up (n=4).
Persistent peripheral neuropathy occurred in 19.4% (24/124) of participants. No significant difference in survival was observed between MDR-TB groups (A vs. B; p=0.69) or pre-XDR-TB groups (C vs. D; p=0.41).



Conclusions: Tailored 9-month all-oral five-drug regimens demonstrated sustained long-term efficacy and acceptable safety profiles for MDR-TB and pre-XDR-TB patients during 36 months of follow-up, supporting their broader implementation in clinical practice.

EP58-1263-21 The hidden challenge: Impact of *M. tuberculosis* strains With *rpoB* I491F mutation on outcomes of the BPaLM regimen

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Background and challenges to implementation: Eswatini adopted BPaLM (bedaquiline, pretomanid, linezolid and moxifloxacin) and BPaL as primary regimens for patients with rifampicin resistant tuberculosis (RR-TB) and implemented targeted next generation sequencing for rapid drug resistance diagnosis and detection of multi-

drug resistant (MDR) *Mycobacterium tuberculosis* strains with *rpoB* I491F mutation which are not detected by Xpert® MTB/RIF, line probe assays(LPA) or conventional diagnostics. Locally, the Rv0678 M146T mutation that correlates with resistance to bedaquiline and clofazimine is associated with the presence of *rpoB* I491F strains. The clinical significance of these mutations in patients initiated on BPaLM regimen remains unclear.

This study aimed to assess whether infection with I491F strains affected the treatment outcomes of patients enrolled on the BPaL/M regimen.

Intervention or response: Patients diagnosed with isoniazid monoresistance, polydrug resistance, or rifampicin-resistant TB (RR-TB) via Xpert MTB/RIF, LPA, or MGIT culture underwent tNGS using Genoscreen Deeplex® Myc-TB kits on the Illumina iSeq 100 platform to detect additional resistance-conferring mutations. Those with confirmed or presumed RR-TB were considered for BPaL or BPaLM based on fluoroquinolone resistance status. Routine monitoring and evaluation systems were used to assess BPaLM uptake, treatment outcomes, and the prevalence of rpoB I491F mutation among enrolled patients. Associations between this mutation, bedaquiline resistance, and treatment success were analyzed.

Results/Impact: Of 252 patients enrolled in DR-TB treatment between January 2023 and December 2024, 177 were eligible for BPaLM, and 147 were initiated on the regimen.

HIV positive	151(59.9%)	N=252
On ART	141(93.4%)	N=151
Elligible BPaLM/BPaL	177(70.2%)	N=252
Initiated BPaLM/BPaL(Uptake)	147(83.1%)	N=177
Sequencing done	91(51.4%)	N=177
I491F Mutation	53(58.2%)	N=91
Rvo678 mutation(BDQ/CFZ resistance)	39(42.9%)	N=91
BPaLM Treatment success without I491F mutation	17(94.4%)	N=18
BPaLM Treatment success with I491F mutation	19(90.5%)	N=21
BPaLM Treatment success without tNGS results	42(84.0%)	N=50

Conclusions: The high prevalence of rpoB I491F mutation in this cohort highlights the need for expanded molecular diagnostics to guide DR-TB treatment. Moreover, its strong association with bedaquiline and clofazimine resistance raises concerns about potential treatment challenges.

Although this study did not find a statistically significant impact of rpoB I491F-associated resistance on BPaLM treatment outcomes, further research is warranted to assess its long-term effects, particularly on treatment efficacy and the selection of additional resistance.

EP59 Digital and AI-driven approaches to integrated TB and respiratory health management

EP59-1264-21 Integrated, community-centered screening for chronic respiratory diseases in high-risk Nairobi hotspots using digital chest X-rays with artificial intelligence (AI)

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Background and challenges to implementation: Chronic respiratory diseases such as chronic obstructive pulmonary disease (COPD), tuberculosis, asthma, and lung cancer represent a major global health challenge. In 2024, Nairobi reported 55,052 lower respiratory tract diseases, 94,890 pneumonia, and 13,916 cases of tuberculosis(TB).

Although these statistics are concerning, significant gaps remain in the early detection and efficient management of these diseases. To address this gap, the County together with implementing partners piloted an integrated lung health outreach in high-risk areas of Nairobi, using digital chest X-rays with artificial intelligence (AI) for early diagnosis.

Intervention or response: From February to March 2025, the County organized 10 targeted community screenings on chronic respiratory diseases. The efforts were focused on tuberculosis hotspot areas, deliberately chosen to act as strategic entry points for targeted screening initiatives. Community health promoters sensitized population living within the sites on lung health and mobilized them to visit designated screening centers.

Counseling was provided, and those who consented underwent an initial digital chest X-ray with AI. Individuals with abnormal X-ray results were subsequently evaluated by clinicians and referred for Gene Xpert testing and other diagnostic investigations.

Results/Impact: A total of 2,863 individuals received messages about chronic respiratory disease. 77% (2,191) underwent screening using digital chest X-rays. Among those screened, 15% (336/2191) exhibited abnormal X-ray results indicative of tuberculosis and were referred for GeneXpert testing.

Ultimately, 130 (39%) TB cases were identified, with 86 bacteriologically and 44 clinically confirmed.

Additionally, 3% (67/ 2191) had other abnormal chest findings. Among these cases, 34 (51%) were indicative of asthma, 11(16%) of COPD, 16 (24%) of post-TB lung disease, 4 (6%) lung cancer, and 2 (3%) pneumothorax.

Conclusions: Digital chest X-rays with AI have proven to be highly effective tool for screening chronic respiratory diseases. It facilitates the early identification of abnormalities, including tuberculosis, COPD, asthma, and lung cancer, enabling timely intervention and treatment.

EP59-1265-21 Reimagining integrated screening: Preliminary findings from an AI-driven TB and lung health initiative in Pakistan

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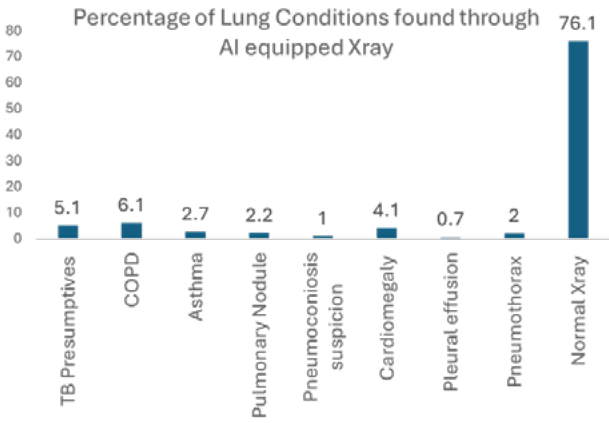
Background and challenges to implementation: Occupationally exposed and socially marginalized populations in Pakistan—including coal-miners, brick-kiln workers, cotton-ginners, transgenders etc.—carry a high burden of TB and other respiratory-diseases. These groups often live and work in areas with limited access to diagnostic services. Seeking care frequently means wage loss, discouraging early detection. Traditional TB screening often overlooks individuals with respiratory symptoms who test negative.
This initiative introduces an integrated service delivery model combining AI-enabled TB screening, lung function testing, and community outreach to deliver equitable, multi-disease diagnosis at the community and workplace level.
Intervention or response: Mobile teams conducted ACF in four provinces using AI-enabled ultraportable digital X-rays, outreach workers, and real-time digital tools. Individuals with TB symptoms were tested via GeneXpert. For non-TB lung conditions, a tiered strategy was applied: peak flow testing for symptomatic individuals, followed by digital spirometry only if abnormal, improving efficiency and reducing burden.
Portable digital spirometers were used in the field. Data were integrated into electronic systems. Upcoming phases will pilot TB tongue swabs, cough AI, and multipathogen diagnostics.
Results/Impact: Preliminary findings show:
• CXR coverage: 99.8%, with 5.1% AI-flagged presumptive TB.
• TB Detection: 1.5% positivity
• Pulmonary findings included:
o COPD (6.1%)
o Asthma (2.7%)
o Cardiomegaly (4.1%)
o Pulmonary nodules (2.2%)
o Pneumothorax (2.0%)
o Pleural effusion (0.7%)
o Pneumoconiosis suspicion (1%)
Field-based peak flow testing and spirometry were successfully implemented with high acceptance and clinical utility for triage



Conclusions: This model demonstrates the feasibility and operational innovation of integrating TB and lung health services in high-risk populations. By leveraging AI for triage, using symptom-guided peak flow testing, and selectively applying digital spirometry, ReachTB+ ensures high-yield diagnosis with efficient resource use.
As the project scales, integration with national strategies and newer Next-Gen Tools, can support broader implementation of ISD models and position Pakistan as a leader in digitally enabled, community-centric TB and NCD prevention.

EP59-1266-21 Artificial intelligence-driven increase in TB preventive treatment in prison settings in Mozambique

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Background: Mozambique has a high burden of incident tuberculosis (TB): 361 per 100,000 population. Incarcerated persons have a higher risk for TB disease than the general population. WHO recommends tuberculosis preventive treatment (TPT) for TB infection and active case finding for TB disease in high-risk populations. The National Penitentiary Service of Mozambique, in a Health through Walls-led project, expanded TPT delivery in prisons while deploying artificial intelligence (AI) interpreted chest x-rays to systematically screen for TB disease, facilitating diagnosis and treatment.

Design/Methods: A longitudinal, integrated health TB screening (Q3 July 2023 to Q2 June 2024) was implemented at three intervention prisons, using symptoms and digital chest x-rays, interpreted by AI-enabled software (qXR v3.2, Qure.ai). Data was obtained from two control prisons, which continued symptom screening without the AI-interpreted-chest-x-ray intervention. Residents were offered tuberculin skin tests (TST); TPT was delivered to those at highest risk for developing TB disease (including HIV infection and TB contacts) following exclusion of TB disease with AI-read chest x-rays. The Mozambican National Bioethics Committee and Emory University IRB approved the project.

Results: Of 7912 individuals screened at the intervention prisons, 264 residents with TB disease were notified and 2819 considered for TPT initiation based on risk assessments. TST acceptance was spotty, reportedly due to misconceptions regarding what was injected. Nevertheless, 1346 initiated TPT. Comparing against a historical baseline (Q3 July 2022 to Q2 June 2023), TPT initiations in intervention prisons increased in number and proportion: from 156 to 1346 and 1.78% to 17.01% of total screened residents. While TPT initiations increased by only 52% in the control prisons, the increase was 763% in the intervention prisons.

TPT initiation before and during the intervention period

Parameters	Year & Quarter	Number of persons initiated on TPT		Total screened over 4 quarters	TPT initiation/ Total screened (intervention prisons only)
		Intervention Prisons (Total ADP* = 4292)	Control Prisons (Total ADP* = 2672)		
Historical Baseline (Pre -AI Implementation Period)	Q3 2022	64	33	8759	156/8759 (**1.78%**)
	Q4 2022	64	64		
	Q1 2023	17	22		
	Q2 2023	11	21		
	Total	**156**	**170**		
AI Implementation Period	Q3 2023	278	41	7912	1346/7912 (**17.01%**)
	Q4 2023	516	127		
	Q1 2024	303	66		
	Q2 2024	249	25		
	Total	**1346**	**259**		
% change in TPT initiations from historical baseline		763%	52%		

*ADP: Average daily population

Conclusions: AI interpretation of chest X-rays appeared to have facilitated an increase in TPT delivery, in addition to higher notification of newly diagnosed TB cases, in this prison system.

EP59-1267-21 Perceptions of smartphone-based cough-audio TB triage among health facility clients: Findings from qualitative implementation research in CAGE-TB

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Background: In sub-Saharan Africa, undiagnosed tuberculosis (TB) and delayed care-seeking contribute to ongoing disease transmission. Supported by EDCTP2, Cough Audio triaGE for TB (CAGE-TB) aims to develop a smartphone-integrated cough-audio classifier for TB triage in high-burden settings. We prospectively explored the perspectives of smartphone-based cough-audio TB triage among health facility clients.

Design/Methods: We conducted semi-structured interviews with clients (≥18 years) at four health facilities in Cape Town, South Africa and six in Kampala, Uganda in 2023 and 2024. Participants were purposively sampled for diversity from clients seeking care for TB suggestive symptoms or enrolled in TB/HIV care.

Interviews addressed experiences of TB and health services, technology use, and the CAGE-TB prototype. Interviews were audio recorded, transcribed, and translated to English if necessary. Transcripts were thematically analysed using MAXQDA 24.

Results: We interviewed 55 participants (31 in South Africa; 24 in Uganda), 58% women, aged 18-84 (avg. 35 years). Participants' knowledge about TB symptoms, prevention, and treatment varied, with some misconceptions. There were reports of delayed care-seeking and long pathways to diagnosis in a context of widespread TB-associated HIV and TB-related stigma. Participants described their communities and living conditions as overcrowded/unhygienic, with increased risk for disease.

Participants viewed the concept of smartphone-based cough-audio TB triage in health facilities as innovative, identifying the potential for earlier TB detection and increased TB awareness. Many expressed a desire for using it at home/community.

There were however concerns/distrust from older, less tech-savvy participants, with a preference for familiar/routine TB care. Other concerns related to privacy/TB stigma as well as infection control.

Conclusions: Clients in South Africa and Uganda are open to a smartphone-based cough-audio TB triage test. The design must however align with existing TB services,

include infection control, and TB-related advocacy to facilitate trust and use. Continued end-user engagement is essential to minimise potential for TB stigma.

EP59-1268-21 Active case finding and detection of TB infection among incarcerated populations using an artificial intelligence-aided portable handheld X-ray machine in Himachal Pradesh, India

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Background and challenges to implementation: Tuberculosis (TB) remains a significant health challenge in congregate settings. The National Tuberculosis Elimination Program's (NTEP) 100-Day intensified case-finding TB campaign targets vulnerable groups, including the incarcerated population. In Mandi District Prison, Himachal Pradesh, the health administration, coordinating with the prison department and community stakeholders, conducted AI-enabled handheld X-ray screenings to detect active TB and identify infections, demonstrating effective multi-sectoral collaboration.
Intervention or response: In December 2024, a targeted TB screening initiative was implemented in Mandi jail, screening 206 incarcerated individuals with an AI-equipped handheld X-ray and 10 TB symptoms. Those with symptoms or abnormal X-rays were classified as presumed TB cases, and samples were sent for NAAT. Confirmed cases entered the TB care cascade, while asymptomatic individuals with normal X-rays underwent Cy-TB skin testing. Positive cases started a shorter TB Preventive Treatment (3HP), and others were scheduled for follow-up in three months. Data was analyzed on Nikshay using SPSS ver22.
Results/Impact: Of the 206 incarcerated people screened, 15 asymptomatic individuals had abnormal chest X-rays. NAAT testing confirmed TB in 3 persons (20% diagnostic yield), all of whom began treatment (*Figure1*).
Among 203 people deprived of their liberty who underwent Cy-TB testing, 72 (35%) were positive for latent TB infection and were started on preventive therapy. Rest were followed up after three months, with no progression to active TB.

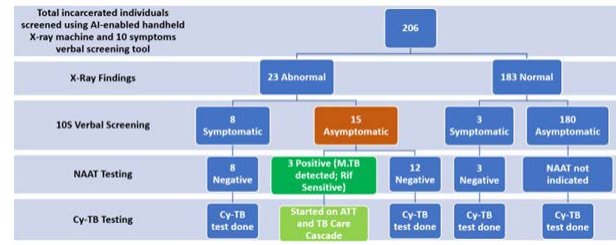

Figure 1. TB diagnostic cascade in Mandi Prison, Himachal Pradesh (2024).

Conclusions: AI-assisted handheld X-ray screening was effective in detecting asymptomatic TB in a prison setting. This initiative underscores the importance of technology and coordinated efforts in enhancing TB detection and prevention in high-risk environments.

EP59-1269-21 A quarter of a century of TB-CAD research: A bibliometric overview of themes, tools, and global partnerships

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Background: In 2020, the World Health Organization recommended the use of computer-aided detection (CAD) for chest X-ray assessment in adults for screening and triage. Since then, uptake has increased at the country level, with many new CAD products now available. Using bibliometric analysis, we map the evolution of tuberculosis-CAD (TB-CAD) research from 2000 to 2024, identifying core publication sources, thematic shifts, and assessing geographic distribution, collaboration patterns, and tool adoption.
Design/Methods: We conducted a comprehensive literature search across PubMed, Scopus, Embase, Cochrane and Web of Science to identify original research articles meeting our inclusion criteria. We used Microsoft Excel, Bibliometrix (R), and Python to synthesize data, and perform bibliometric analyses. Our analysis covered nine indicators: publication trends, journal dispersion using Bradford's Law, study type evolution, funding sources, geographic and research collaboration trends, study population distribution, keyword trends, CAD software usage, and deep learning architectures.
Results: A total of 9,190 articles were identified; 349 met inclusion. Publications increased markedly after 2018, with Scientific Reports as the leading journal. India led first-author publications (20%), while the USA was the top funder (6%). CAD4TB was the most used tool, with Qure.ai and Lunit gaining traction post-2019. ResNet and

EfficientNet were the most applied deep learning models. China and the USA contributed the largest study populations, mostly via public datasets for algorithm development. Strong collaborations were seen between high-income and TB-endemic countries. Thematic analysis showed a shift from earlier CAD to deep learning, with publications rising from under 5 before 2019 to over 20 annually by 2020–2022.

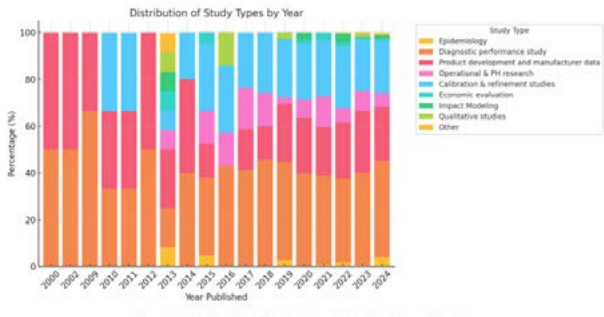

Figure 4b. Distribution of Study Types in TB-CAD Research by Year

Each stacked bar shows the percentage distribution of study types by publication year. Early research focused on product development, while later years show diversification into operational, economic, and implementation-oriented studies.

Conclusions: TB-CAD research has grown rapidly and shifted toward implementation-oriented, artificial intelligence-based diagnostics. Our study highlights research and development trends and identifies research gaps in the expanding field of artificial intelligence and digital tools for TB and global health, supporting TB screening through strategic investment and cross-sector collaboration.

EP59-1270-21 Evaluating CAD software performance in handling erroneous chest radiograph images

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Background: The reliability of computer-aided detection (CAD) systems depends on their ability to handle erroneous or poor-quality images effectively in real-world clinical settings. Many CAD software are designed to read exclusively frontal chest X-ray images (CXRs) and claim to reject CXRs with quality issues affecting interpretation, but this has not yet been tested.
Design/Methods: We created a specialized dataset (n=2,912), mixing 2,812 frontal CXRs of radiologist-verified quality with 100 CXRs with radiologist-verified errors. Errors were evenly distributed between CXRs with image quality challenges, CXRs taken from additional angles, non-CXR images, and pediatric CXRs below the designated manufacturer age limit. 3 CAD software read the mixed dataset. Rejected images and reasons for rejection were recorded for calculation of metrics including Rejection Rate (RR), Error Detection Rate (EDR), and False Alarm Rate (FAR) when processing both error datasets alongside standard datasets.
Results: CAD1 had the highest overall RR, rejecting 63% of erroneous images but correctly identifying the error in only 25% of these. CAD1 also had the highest FAR (6.44%), rejecting the most images without errors, as verified by radiologists. CAD2 and CAD3 demonstrated substantially lower error-detection capability, rejecting 10% and 2% of the error dataset respectively. CAD2 correctly identified the error in 6% of cases, while CAD3 failed to correctly identify the error in both of the erroneous images it correctly rejected. CAD2 and CAD3 also had the lowest false alarm rates. CAD3 did not reject any of the verified CXRs (FAR=0%), while CAD2 had FAR of 1.14%.

	CAD1	CAD2	CAD3
Number of correctly detected errors (of 100)	25	6	0
Number of detected errors, incorrect error message (of 100)	38	4	2
Number of errors not detected (of 100)	37	90	98
Number of false errors (of 2,812)	181	32	0
Rejection rate (%)	63.0	10.0	2.0
Error detection rate (%)	25.0	6.0	0
False alarm rate (%)	6.44	1.14	0

Table 1. Errors correctly detected, mistakenly detected, and missed by CAD.

Conclusions: All three CAD technologies showed limitations in handling erroneous images, with different strengths and weaknesses. CAD1 was most effective at detecting errors but generated more false alarms with standard images. CAD3 processed almost all images regardless of quality, largely failing to flag technical errors.

EP59-1271-21 Use of multimodal computer aided detection software for optimisation of lung health services in Kenya

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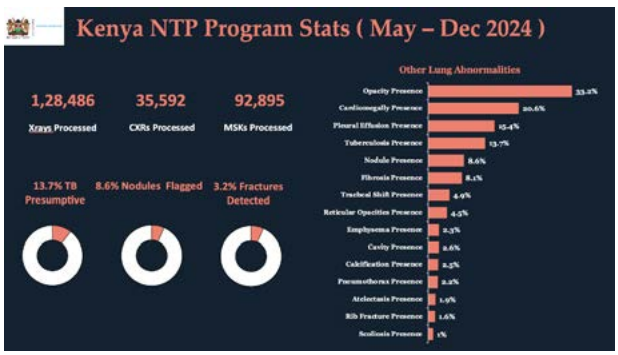
Background and challenges to implementation: Kenya had an estimated 124,000 TB cases in 2024, with 96,865 cases notified, leaving a 20% diagnostic gap and emphasizing the need for better TB detection methods. TB and chronic lung diseases share patient care pathways, increasing patient vulnerability, healthcare costs, and straining resource-limited programs. A lack of lung health data hinders decision-making. Referrals due to shortage of radiologists increase patient costs and delay diagnosis. Recent changes in funding underscore the need for cost-effective interventions that optimise the impact of lung health programs.
Intervention or response: In May 2024, the Kenya TB program through Global Fund support deployed multimodal Computer-Aided Detection software (CAD) in 69 healthcare facilities. We revised the diagnostic algorithm to incorporate the use of CAD and trained healthcare workers on its use. The CAD was used to analyze all scans, regardless of clinical indications, broadening TB screening and enabling timely detection of other thoracic abnormalities.
Results/Impact: CAD data for 128,000 digital chest x-rays from 69 health facilities between May and December 2024 detected 13.7% (4,725) scans as potential TB cases who were referred for TB testing and treatment.



Other thoracic abnormalities, including Pulmonary nodules (8.6%, 916 cases), Rib/thoracic fractures (3.2%, 414 cases), Cardiomegaly (20.6%, 6,171 cases), Pleural effusion (15.4%, 2,866 cases), Emphysema (2.3%, 493 cases), Pneumothorax (2.2%, 437 cases) and Pulmonary fibrosis (8.1%, 1,312 cases) were identified and patients referred for further evaluation and management.
Conclusions: Use of multimodal CAD software enables simultaneous screening for TB, post-TB sequelae, and other lung conditions allowing timely diagnosis and management. This reduces radiology referrals and streamlines patient care pathways for TB and chronic lung diseases. It maximizes the impact of lung health programs, reducing the strain on resource-limited settings.
Scale-up will focus on strengthening monitoring and referral systems, validation of CAD for other lung conditions and Quality Assurance programs for CAD.

EP59-1272-21 Accuracy of computer-aided detection systems for identifying specific non-TB pulmonary findings

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Background: Beyond tuberculosis (TB) detection, computer-aided detection (CAD) systems have the potential to identify various pulmonary abnormalities, enhancing their utility in comprehensive chest radiograph (CXR) interpretation. This study evaluated the accuracy of two CAD technologies in detecting specific non-TB pulmonary findings.
Design/Methods: We analyzed CXRs from both adult (n=2,812) and pediatric (n=1,476) datasets. Performance was evaluated against a radiological reference standard (RRS) established through consensus readings by expert radiologists.
We focused on three findings with sufficient sample sizes for statistical power: consolidation, fibrosis, and atelectasis. For each finding, we calculated the area under the receiver operating characteristic curve (AUC-ROC). CAD systems were only evaluated for age groups recommended by manufacturers.
Results: In the adult dataset, the AUC-ROCs of CAD1 were 0.82 (95% CI: 0.79-0.85) for atelectasis, 0.73 (0.71-0.75) for consolidation, and 0.66 (0.64-0.66) for fibrosis. CAD2 significantly outperformed CAD1 when identifying consolidation (AUC-ROC: 0.86 [0.84-0.87]), achieved similar performance for fibrosis (0.66 [0.64-0.68]) and was less accurate at detecting atelectasis, although this was not significant (0.79 [0.77-0.81]). In children 3 years and older (n=1,216), CAD1 achieved perfect accuracy in detecting pleural effusion (AUC-ROC: 1), followed by fibrosis, atelectasis, and consolidation, which all achieved AUC-ROC > 0.75.

Similarly, in children aged 14 years and older (n=142), CAD2 achieved perfect accuracy for pleural effusion (AUC-ROC: 1), followed by atelectasis, consolidation, and fibrosis, all with AUC-ROC > 0.85.

	CAD1 AUC (95% CI)	CAD2 AUC (95% CI)
Adults (15 years and older)	n= 2,812	
Fibrosis	0.66 (0.64-0.69)	0.66 (0.64-0.68)
Consolidation	0.73 (0.71-0.75)	0.86 (0.84-0.87)
Atelectasis	0.82 (0.79-0.85)	0.79 (0.77-0.81)
Children (< 15 years)	n= 1,216	n= 142
Consolidation	0.76 (0.73-0.80)	0.89 (0.80-0.97)
Fibrosis	0.85 (0.78-0.93)	0.86 (0.73-0.99)
Atelectasis	0.84 (0.72-0.96)	0.97 (0.93-1.0)
Pleural effusion	1	1

Table 1. CAD AUC for selected individual findings in adults and children.

Conclusions: CAD1 and CAD2 demonstrated good accuracy in detecting specific non-TB pulmonary findings in adults and children. These results highlight the potential of CAD technologies to support comprehensive CXR interpretation beyond TB screening, particularly for identifying non-TB abnormalities.

EP59-1273-21 Radiology a high-risk section for airborne infections including TB: Array of possible interventions in India

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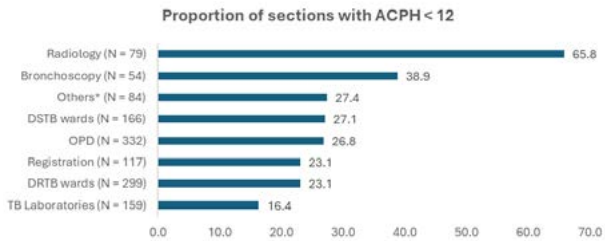
Background and challenges to implementation: Health care facilities (HCF) have risk of airborne infections including TB, but focus is more on Infection prevention and control. For airborne infection control (AIC), ventilation with air changes per hour (ACPH) is critical parameter which is not routinely monitored. CDC and ASHRAE guidelines recommend ACPH > 12 in high-risk sections of HCF. Identifying sections within HCF for risk of airborne infection is imperative for designing, implementation and monitoring of AIC measures.
Intervention or response: National TB Elimination program (NTEP) of India with FIND and WHO conducted risk assessment in 185 Drug resistant TB (DR-TB) centres in two phases (100 sites from Sep'22 – Jun'23) and (85 sites from Apr – Dec'24). Phase-1 six sites are not included in analysis due to shifting or demolition. Special emphasis on assessment of radiology section as TB and respiratory symptoms patients visit this section. Air changes per hour (ACPH) calculated using ASHRAE standards.
Results/Impact: ACPH was measured in total 1290 of 1641 sections assessed across 179 DR-TB centres since others were closed rooms. In radiology ACPH measured in 79 of 200 sections assessed. Fig 1 shows proportion of different sections assessed with ACPH < 12.



Radiology has maximum (65.8%) proportion of sections with ACPH < 12 making it most vulnerable section within HCF for airborne infections. Shifting of radiology section not possible since equipments are fixed.
Conclusions: Improving ventilation (ACPH) in radiology section is challenging. Array of alternative solutions are creation of well-ventilated waiting areas; triage, segregation and fast tracking of TB and respiratory symptoms patients; provision of mask to these patients by HCF; identified dedicated machines (digital x-ray, USG) for these patients; token systems for crowd management; segregated radiology facilities for vulnerable patients like pregnant mothers, and children; separate x-ray facility in TB OPD. New radiology facilities should have well-ventilated waiting areas and implement above-mentioned interventions.

EP60 Innovations in TB Modelling for vaccination, diagnosis and treatment

EP60-1274-21 Modelling the Covid-19 pandemic impact on the diagnosis of child and adolescent TB in South Africa

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Background: A global modelling study estimated that observed versus predicted tuberculosis notifications in children aged <5 years had declined by 35.4% in 2020 due to COVID-19 pandemic-related effects, approximately double the estimated decline in people ≥15 years (-18.8%). We used enhanced surveillance data from the Western Cape (WC) to investigate the impact of COVID-19 on tuberculosis diagnoses in children and adolescents versus adults.

Design/Methods: We analysed de-identified aggregate data on tuberculosis episodes for 2017-2022, by HIV status, setting and age (0-1, 2-4, 5-9, 10-14, 15-19, ≥20 years). Tuberculosis diagnosis incidence was calculated using mid-year population estimates from the provincial Thembisa model.

Autoregressive integrated moving average (ARIMA) time-series modelling was used to forecast expected tuberculosis episodes and incidence from March 2020 onward, based on pre-pandemic trends (Jan 2017-Feb 2020).

Results: From 2017 through 2022, there were 286,194 tuberculosis episodes diagnosed, with 48,126 (16.8%) in 0-19-years-olds. ARIMA models estimated the largest percentage difference in observed versus forecasted tuberculosis diagnoses in the 0–1-year age group at -39.9% (95% prediction interval [PI]: -28.2 to -48.4), almost double the estimated difference in adults (-22.1; 95%PI: -15.9 to -27.5).

Decline in tuberculosis diagnosis incidence varied by HIV status in children, with those with unknown HIV status having the largest estimated percentage difference (-31%; 95%PI: -27.1 to -34.5), followed by children living with HIV (CLHIV) (-22%; 95%PI: -20.2 to -23.7). Similar percentage differences (~19%), were estimated for children in urban versus. rural areas. By 2022, the observed values had realigned with forecasted diagnoses for each age group, with adults realigning the fastest (Figure).

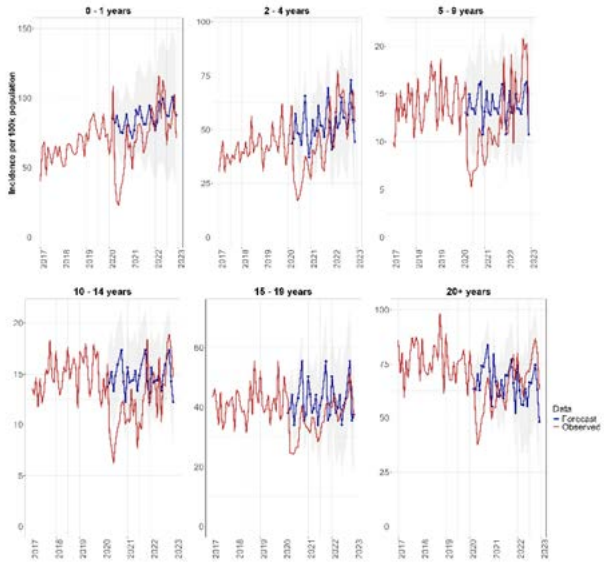

Figure. Monthly time-series of tuberculosis incidence of diagnosis by age group in the Western Cape.
Dark blue lines represent forecasted data, red lines observed data, and grey shading 95% prediction intervals.

Conclusions: We found noticeable differences between observed and forecasted numbers of tuberculosis diagnosis across all age groups. Children and adolescents experienced the most severe and longest duration of impact, particularly infants (<1 year of age), highlighting their increased vulnerability during pandemic response periods.

EP60-1275-21 Targeted TB vaccination strategies in India: Impact of risk-based vs. geographic approaches using mathematical modelling

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Background: Tuberculosis (TB) vaccination will be critical for achieving the End TB goals. India, with world's highest TB burden, faces key policy questions on what targeting strategies – e.g. high-risk groups or specific geographies – would be most effective.
Mathematical modeling of TB transmission dynamics offers a valuable tool to assess the potential impact of these strategies.
Design/Methods: We developed a mathematical model of TB transmission in India, incorporating key factors such as age, nutritional status (Body mass index (BMI) below and above 18.5 kg/m^2), diabetes mellitus (DM), urban and rural settings, and public and private healthcare sectors.
Assuming a prevention-of-disease (PoD) vaccine with 50% efficacy, we evaluated three targeting strategies:
i. Vaccinating individuals with low BMI,
ii. Vaccinating those in urban areas, and
iii. Vaccinating individuals with DM.
The vaccine was modelled to become available in 2027, scaling up linearly by 2030, assuming a coverage of 80% in all scenarios, with a single lifetime dose providing immunity for an average of ten years.
Results: Targeting individuals with low BMI led to the most substantial reductions in both TB incidence and mortality rates by 2040, decreasing cumulative incidence by 6.8% (95% CI 5.1–9.0) and cumulative mortality by 5.5% (95% CI 4.1–7.5). The DM focused strategy reduced cumulative incidence by 3.7% (95% CI 2.4–6.2), and cumulative mortality by 3.0% (95% CI 1.9–4.9).
The urban-targeted strategy had a comparable impact in morality cumulative mortality by 3.0% (95% CI 1.6–6.4), while reducing cumulative incidence by 5.4% (95% CI 3.7– 8.9).
Conclusions: Risk-based vaccine targeting, particularly for individuals with low BMI, may yield greater reductions in TB incidence and mortality than geographic approaches. In practice, however, challenges in identifying and reaching high-risk populations – especially those with low BMI or DM – must be considered in implementation strategies.

EP60-1276-21 The potential epidemiological impact of TB screening among previously incarcerated individuals for TB in Brazil

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Background: Incarceration is a major driver of tuberculosis (TB) in Brazil (transmission population attributable fraction of 36.9% in 2019), and increasing. Incarcerated individuals face strongly increased risks of TB due to overcrowding, poorly ventilated facilities and high rates of re-incarceration, all contributing to high levels of repeated reinfection and progression- further increasing the risk of infection post-release. While prison-specific TB interventions are being studied, little focus has been given to previously incarcerated individuals, despite their potential role in transmission.
Design/Methods: We calibrated a deterministic TB infection transmission model to TB epidemiology and incarceration indicators in Brazil. We implemented a screening intervention where previously incarcerated individuals were screened with Xpert Ultra annually. Screening and treatment was held at 2025 levels for both currently incarcerated individuals and community individuals.
We assumed a five-year scale-up period for the screening intervention among previously incarcerated individuals (2025-2030) and a continuation until 2050. We modelled a range of hypothetical scenarios that assumed low (25%), medium (50%), and highly optimistic (80%) annual coverage.
Results: By 2050, TB prevalence in Brazil could drop by approximately 20%, 35%, and 45% under low, medium, and highly optimistic coverage scenarios, respectively. TB deaths could decline by approximately 15%, 25%, and 30%, respectively.
Conclusions: Screening for previously incarcerated individuals could be epidemiologically impactful, likely driven by high prevalence of recent (re-)infection among this population, and the high risk of re-incarceration. Given the epidemiological potential, it is worth investi-

gating approaches to overcome the logistical challenges of reaching this vulnerable population. Data is needed to better understand what levels of coverage are realistically achievable.

EP60-1277-21 The delivery of new TB vaccines to people living with HIV: When to vaccinate?

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Background: Tuberculosis (TB) remains a major cause of morbidity and mortality in people living with HIV (PLHIV). New TB vaccines may help reduce this burden. There is limited data on the response to new TB vaccines in PLHIV and how this may vary with levels of immunosuppression and anti-retroviral therapy (ART).
The potential interaction between vaccine efficacy and ART raises questions about the optimum timing of vaccination against TB in PLHIV.
Design/Methods: Using a simple cumulative risk model, we compared the impact of different TB vaccination strategies for PLHIV. We compared the impact of vaccinating at linkage to HIV care, to the impact of vaccinating at ART initiation. We explored how the optimum timing of vaccination depends on characteristics of the vaccine and the ART program at an individual and population level.
Results: For an individual, the optimum timing of vaccination against TB is at ART initiation unless the time to ART initiation is more than 6 months or if the reduction in vaccine efficacy when given prior to ART is small (see Figure 1).

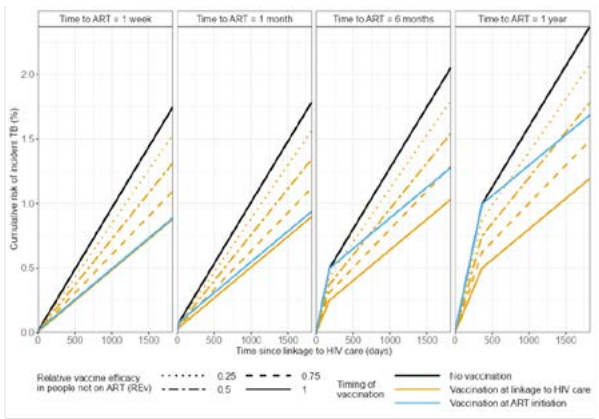

Figure 1. Cumulative risk of incident TB in individuals by time since linkage to HIV care. Colours show the different scenarios for the timing of vaccination. Line types show different relative vaccine efficacy in the absence of ART (compared to when on ART) (RE_v). Columns show different times to ART initiation (τ_{ART}).

At a population level, the proportion of PLHIV who initiate ART is a key determinant of the optimum strategy. If ART uptake is low, it would be better to vaccinate at linkage to HIV care, even if vaccine efficacy in ART naïve individuals is less than 50% of efficacy in individuals on ART.
Conclusions: Our results suggest that the optimum timing of new TB vaccination for PLHIV will depend on the relative efficacy of vaccination in ART-naïve individuals vs individuals on ART, and the uptake and timing of ART initiation.
If vaccine efficacy is lower among ART-naïve individuals, improvements in HIV programs may help maximize the impact of new TB vaccines.

EP60-1278-21 Impacts of diagnostic sensitivity on mortality in paediatric TB

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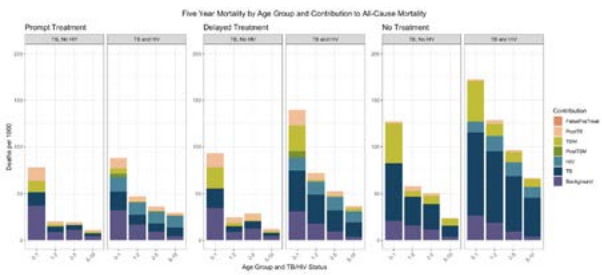
Background: Early and accurate diagnosis of pediatric tuberculosis (TB) remains a major global challenge. Children with undiagnosed and untreated TB face increased risks of morbidity and mortality, including severe complications like tuberculous meningitis (TBM). We developed a microsimulation model to evaluate how changes in pediatric TB diagnostic sensitivity impact lifetime health outcomes.
Design/Methods: We simulated a cohort of 10,000 children (<10 years) undergoing pulmonary TB assessment at primary healthcare centers, tracking their lifetime health status, TB/HIV progression, and healthcare interactions, including loss to follow-up and return to care. Life expectancy was calculated for three diagnostic scenarios:
1. Prompt Treatment: As would result from a correct TB diagnosis at initial evaluation and receipt of timely treatment.
2. Delayed Treatment: As would result from TB diagnosis missed at initial evaluation. Some children would return for care as symptoms worsen.
3. No Treatment: Hypothetical scenario assuming no access to TB diagnosis and treatment.

Using the results of these scenarios, we assessed changes in five-year mortality from initial evaluation, causes of death, and life expectancy with incremental improvements in diagnostic sensitivity by TB/HIV status and age-group.

Results: Among children aged 0–1 with both TB and HIV, five-year mortality declined from 174 per 1,000 in the No Treatment scenario to 82 per 1,000 in the Prompt Treatment scenario (Figure).

Excess mortality due to TB and TBM were leading contributors to overall mortality in the No Treatment scenario, particularly in those with HIV. Each percentage point increase in diagnostic sensitivity raised life expectancy by 0.024 years in children with TB and 0.044 years in those with TB and HIV.



Conclusions: Enhancing pediatric TB diagnosis can substantially improve survival, particularly in high-risk groups such as infants and children with TB/HIV co-infection.

EP60-1279-21 Potential long-acting TB treatment for people with HIV in South Africa: Cost-effectiveness benchmarks

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Background: Long-acting tuberculosis drugs could improve tuberculosis treatment outcomes in South Africa, where there is high prevalence of HIV/tuberculosis co-infection and high attrition from standard tuberculosis treatment, but potential benefits must be weighed against costs.

We sought to identify scenarios where a long-acting tuberculosis treatment would provide clinical benefit and be cost-effective compared with standard tuberculosis treatment for people with HIV in South Africa.

Design/Methods: We used a validated microsimulation model to compare clinical and cost outcomes of:

1. Standard-of-care 6-month daily oral treatment (*SOC*);
2. A long-acting treatment regimen, entailing standard oral therapy for 2 months followed by a one-time injection (*LA*).

Base case parameters for *SOC/LA* included: efficacy, 97.6%/97.6%; disengagement while on oral therapy, 4%/month; and total regimen cost, USD 50/200. Parameters were varied in sensitivity analysis.

Outcomes included disengagement, mortality, tuberculosis relapses, life-years, and healthcare costs. We defined *LA* to be cost-effective compared to standard of care when its incremental cost-effectiveness ratio (ICER) was <USD 3,000 per year-of-life saved (YLS; opportunity cost-based threshold).

Results: In the base case, *LA* would produce less disengagement (10.9% vs. 17.7%) and lower all-cause mortality (10.7% vs. 10.9%) than *SOC* at 6m. Lower mortality would endure at 24m (17.6% vs. 21.7%). More tuberculosis relapses would occur in *LA* compared to *SOC* at 24m, due partly to higher survival. *LA* would be cost-effective

over 24m (ICER $2,580/YLS) and lifetime horizons (ICER $520/YLS) *(Table 1)*. In sensitivity analysis of the 24m horizon, *LA* would be cost-effective compared to *SOC* as long as *LA* efficacy is ≥97%, probability of disengagement on oral treatment in either strategy is ≥4%/month, or *LA* regimen cost is <USD 215.

Table 1. Base case model-projected clinical and economic outcomes of tuberculosis treatment strategies for people with HIV in South Africa.

	Disengagement from TB treatment, %	All-cause mortality, %	TB mortality, %	Life-months, undiscounted	Costs, undiscounted (USD)	ICER, USD/YLS*
24 months						
SOC	12.5	21.7	19.6	20.6	980	-
LA	5.8	17.6	15.5	21.2	1,080	2,580
Lifetime						
SOC	-	-	22.7	313.5	10,980	-
LA	-	-	18.6	329.7	11,640	520

SOC: standard of care; ***LA***: long-acting TB treatment strategy; **USD**: United States dollars; **ICER**: incremental cost-effectiveness ratio; **YLS**: year-of-life saved.

*ICERs were calculated using non-rounded discounted life-months and costs and are displayed as rounded values.

Conclusions: A long-acting injectable tuberculosis treatment regimen could be cost-effective if it maintains high efficacy at reasonable cost, especially when disengagement from standard oral treatment is high.

EP61 Bold actions advancing TB elimination

EP61-1280-21 Impact of person-centred care on treatment outcomes in drug-resistant TB: A case study from Mozambique a low-middle-income country

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Background and challenges to implementation: Drug-Resistant Tuberculosis (DR-TB) case management remains a significant challenge in Mozambique, characterized by low treatment success rates and high mortality and loss to follow-up rates. Contributing factors include poor social conditions such as unemployment, long distances to health facilities, limited knowledge about TB, delayed treatment seeking, incorrect medication intake or non-adherence, and insufficient clinical and laboratory follow-up. These challenges are further compounded by comorbidities, including malnutrition and HIV co-infection, which affect many DR-TB patients.
Intervention or response: The USAID TB project, implemented from 2019 to 2024 in 50 districts covering 54% of the country's population, provided a comprehensive care package, based on a patient-centered approach. This package included psychosocial support (mental health and counseling services), patient education, adherence support, infection control measures, monthly laboratory and clinical monitoring, patient follow-up, TB contact investigation, and Tuberculosis Preventive Therapy (TPT). Patients received pill boxes, cell phones for receiving SMS reminder and a monthly transport allowance of 540 meticais (~USD 8.4). All DR-TB patients were assigned CHCW to support treatment adherence, early detection of adverse drug reactions, and sample referrals for follow-ups tests. Healthcare providers at DR-TB sites were trained to provide individualized treatment plans that addressed the specific needs of each patient, including co-morbidities like HIV and diabetes and adjust the treatments according to the drug resistance profile.
Results/Impact: A total of 2,358 DR-TB patients were notified under the project. Of these, 51% (1198/2358) were female,10% (236/2358) were children under of 15 years old and 23% (542/2358) were HIV-positive. Treatment success increased from 51% (120/236) in 2019 to 82% (384/468) in 2024. The mortality rate decreased from 14% (32/236) in 2019 to 9% (43/468) in 2024.
Conclusions: The implementation of a patient-centered care package, combined with appropriate DR-TB treatment, significantly improved treatment outcomes. These strategies have been shown to enhance treatment adherence, improve outcomes in low-middle-income settings.

EP61-1282-21 Coach Mpilo: Men supporting men through TB and HIV treatment journeys in South Africa

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Background: The Coach Mpilo (CM) program, developed in South Africa, utilizes peer counselors (coaches) to support men's (players') journey in TB, TB/HIV, and HIV treatment. This study explored the experiences and perspectives of CM coaches to understand their successes and challenges and identify areas for improvement.
Design/Methods: We conducted a two-phased study with (n=20) coaches +18 years who were active in the program within the last three years. In phase one, we conducted interviews to understand coach self-efficacy, training application, challenges, masculinity, and personal transformation. In phase two, we used interview findings to guide a photovoice project with focus group discussions with coaches (n=10). Coaches used photography combined with narrative to document and reflect on their roles.
The analysis of the photovoice followed a four-part process: preview, review, cross-photo comparison, and theorizing. The transcripts and accompanying narratives were analyzed thematically.
Results: Coaches reported significant positive impacts on players' treatment adherence and well-being. Primary coach strategies with players included TB & HIV knowledge sharing, building trust, providing composed emotional support, motivating, and addressing stigma. Coaches leveraged personal experiences with TB/HIV and CM training concepts to create bonds with players.
Challenges included managing emotional boundaries, being unable to resolve resource scarcity for players, addressing health misconceptions, and collaborating with healthcare staff.
Coaches experienced personal growth, improved communication skills, and enhanced empathy. The program positively influenced coaches' perspectives on masculinity and related health-seeking behaviors.
Conclusions: The CM program demonstrates promise in improving TB and HIV treatment adherence through peer support. Coach and player shared experiences and cultural understanding contribute to program effectiveness. Future improvements should focus on providing emotional support to coaches, enhancing collaboration skills with healthcare staff, and addressing the impact of resource scarcity on treatment adherence. CM impact extends beyond players, positively transforming coaches and potentially influencing community attitudes toward TB/HIV treatment.

EP61-1283-21 Cash or calories: Preferences for nutritional support among persons with TB in South India

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Background: Undernutrition is a leading cause for Tuberculosis (TB) incidence in India, with some regions attributing nutrition to two-thirds of TB cases. Addressing food security can improve outcomes for people with tuberculosis (PWTB), but elimination efforts either overlook needs or face operational challenges. As part of the ongoing Learning Effect of Parasites and Reinforcing Diets on TB (TB LEOPARD) prospective cohort study (NCT05048485), we surveyed PWTB in South India about their nutritional needs and favored mechanisms of nutritional support.
Design/Methods: We enrolled adults with newly-diagnosed smear-positive pulmonary TB living in Puducherry and Tamil Nadu, India. 47 structured interviews explored PWTB's preferences for National Tuberculosis Elimination Programme (NTEP) support. We used descriptive statistics to understand average monetary requests and nutritional needs.
Results: Study participants preferred cash transfers to food baskets and other forms of nutritional support, when considered individually, but when considering cash

transfers compared to all types of nutritional support (including food baskets, ready to use foods, and prepared foods), participants appeared evenly divided as per their first choice (48.9% vs. 51.1%). Participants' responses also indicated that, if they were to receive monthly direct benefit transfers, approximately ₹2,000 per month would be their preference.

None of the participants, all interviewed two weeks after diagnosis, had received direct benefit transfer payments as part of the Nikshay Poshan Yojana, a social protection program that provides all Indian PWTB with cash transfers to defray food costs.

Conclusions: Our survey revealed that cash transfers were preferable to in-kind support. Our assessment demonstrates that while existing NTEP interventions are addressing the needs of PWTB, gaps remain in implementation. Going forward, a human-centered approach is necessary to address the operational challenges of the current structure.

Nutritional Support Options	Overall Frequency	Proportion of Participants' 1st Preference
Cash Transfer	2.40	48.9%
Food Basket	2.63	29.8%
Ready To Use Foods	2.85	12.8%
Vouchers (to purchase food)	2.89	8.5%
Prepared Foods	4.21	8.5%

Figure 1. Participants ranked the displayed forms of nutritional support on a scale of 1 to 5, with 1 being the most preferable option.

EP61-1284-21 Harnessing the power of private providers: Scaling up TB notification in Niger State

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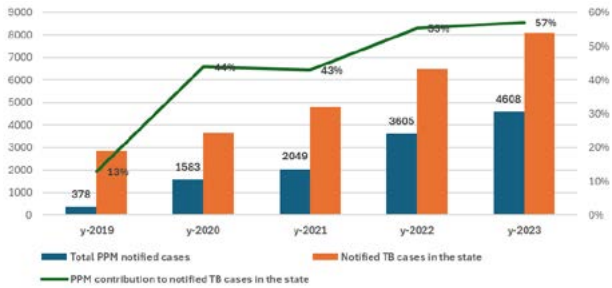
Background and challenges to implementation: In Nigeria, approximately 60% of the population first seek healthcare from private providers, making the private sector a critical entry point for tuberculosis (TB) detection. Despite this, engagement of private providers in TB control has historically been suboptimal. In 2019, Niger State recorded only 13% of its TB case notifications through the Public-Private Mix (PPM) approach.

This abstract evaluates the impact of targeted PPM interventions and highlights the shift in private sector engagement between 2019 and 2023.

Intervention or response: A situation analysis, including a SWOT assessment, was conducted to determine the proportional contribution of PPM and identify operational gaps. Private health facilities were mapped and engaged using a hub-and-spoke model. Entry meetings were held with the Association of General Medical Practitioners of Nigeria (AGMPN) and Patent Medicine Vendors (PMVs) to foster collaboration. Capacity-building training was provided, and NTBLCP recording and reporting tools were distributed. Linkage Coordinators were trained and deployed to support referrals, documentation, and follow-up. Incentives were introduced based on national guidelines. PPM contributions were tracked quarterly using standardized NTBLCP tools.

Results/Impact: TB treatment coverage increased from 22% (2865 persons notified with TB) in 2019 to 64%(10,405 persons with TB notified) in 2024. PPM contribution to total TB case notification in Niger State increased from 13% in 2019 to 57% in 2023. The number of TB cases notified by PPM facilities rose from 378 in 2019 to 4,608 in 2023, representing over a 1100% increase. This trend corresponded with a consistent rise in the state's overall TB case notifications. Key enablers included improved private sector engagement, deployment of screening officers, use of incentives, and strengthened linkage systems.



Conclusions: PPM interventions significantly improved TB case finding in Niger State. This approach demonstrates a scalable model for enhancing TB detection through strategic private sector engagement.

EP61-1285-21 TB-Free Desert Initiative in Rajasthan: A multi-sectoral and diagnostic network optimisation approach in the Thar region

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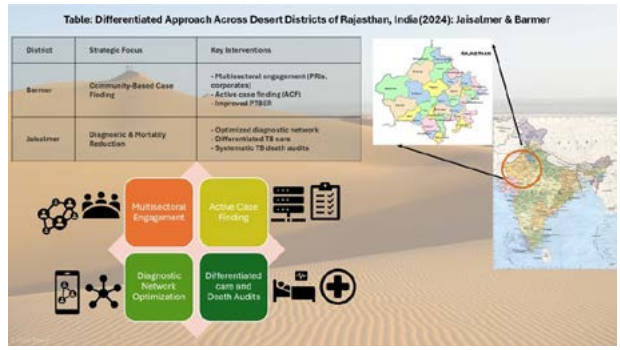
Background and challenges to implementation: The Thar Desert (one of the largest hot sub-tropical deserts) in Rajasthan, India, face unique challenges due to region specific challenges, arid geography, and limited healthcare access. The TB-Free Desert Initiative aims to strengthen TB elimination through a multisectoral and diagnostic network optimization approach, evaluating its impact on case detection, diagnostic efficiency, mortality reduction, and the effectiveness of community-led advocacy and engagement in two desert districts of Rajasthan.
Intervention or response: In 2024, a differentiated approach was implemented across the two intervention districts. Barmer focused on active case finding through multisectoral engagement, while Jaisalmer prioritized diagnostic optimization and mortality reduction.
Data were extracted from *Ni-kshay*, (India's digital TB surveillance system), and analyzed using Microsoft Excel and R version 4.2.3. Key indicators assessed included Presumptive TB Examination Rate (PTBER), number needed to test (NNT), TB mortality, and progress in achieving TB-Free status based on a predefined six-point evaluation framework.
Results/Impact: From 2023 to 2024, Barmer recorded a 43% increase in PTBER and an 80% improvement in NNT; Jaisalmer saw a 20% rise in PTBER and 60% NNT improvement.
Notification rates declined by 4% in Barmer, indicating saturation of case finding, and rose by 8% in Jaisalmer due to better diagnostic access. TB mortality in Jaisalmer reduced from 5% to 4%, aided by optimized diagnostics and targeted care. These outcomes reflect the impact of tailored, district-specific strategies. Barmer achieved 31.5% and Jaisalmer 28.6% TB-Free Gram Panchayat certification underscoring the effectiveness of community-led governance in remote desert regions.



Conclusions: The TB-Free Desert Initiative demonstrates that governance-led, context-specific strategies can improve TB detection and reduce mortality in hard-to-reach desert regions. With proven diagnostic efficiency and community-driven action, the model offers a scalable path toward TB elimination in India's most challenging geographies.

EP61-1286-21 Current realities: Benefits of a diversified project portfolio and adaptive implementation for programme resiliency

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Background and challenges to implementation: The January 20th executive order reverberated globally for donor funded programs. Nigeria with a Tuberculosis (TB) funding gap of 60%, has International funding accounting for 35% of the national TB budget. Kano state, the second most populous in Nigeria is supported for TB program implementation by KNCV Nigeria via two clearly demarcated grants for TB, funded by USAID and the Global Fund (GF) respectively. We share strategies, results and lessons learnt during the first quarter of 2025.
Intervention or response: USAID funded grant portfolio is more robust, supporting TB services across public and private facilities, having community components ensuring outreaches and contact investigation. The GF grant portfolio supports only community TB and Public private mix activities.
Emergency planning meeting was held between the two project teams and stakeholders. Mapping of public and private sector high burden facilities with communities that would be devoid of USAID funded support was

done. Transitioning to GF funded TB program support was facilitated where possible, or hub-spoke linkages established.
Monthly TB patient notification data was analysed from December 2024 to February 2025.
Results/Impact: In December, both programs cumulatively evaluated 26,091 persons found presumptive for TB (14% from GF funded arm) with 1,796 persons diagnosed with TB (11% from GF funded arm). In January, GF funded arm accounted for 30% and 27% of evaluated persons presumptive for TB and persons diagnosed with TB, respectively.
With solitary GF funded implementation In February, 15,542 persons were evaluated for TB (41% drop from average) of which 1,189 persons (36% drop from average) were diagnosed with TB.
Conclusions: Programs over dependent on external funding face dire consequences post executive order. Having a diversified funding portfolio is beneficial, enabling strategic program pivot at crucial times. This period provides a window for revamped domestic stakeholder engagement towards closing the funding gap and ensuring self reliance.

EP61-1287-21 Harnessing rural governance for TB elimination: Findings from a multi-tiered approach to achieving TB-free status in rural India

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Background and challenges to implementation: Eliminating tuberculosis (TB) in India entails targeted action in rural regions, which account for 58% of TB cases and 68% of the population. Collaboration with rural governance structures is vital, as seen during India's polio elimination efforts. A multi-tiered collaborative approach was adopted spanning National to the community level through active engagement with Gram Panchayats (GPs), the foundational units of rural local self-governance.
This initiative institutionalized a structured mechanism for embedding TB elimination agenda in their curriculum to make 2.65 lakhs GPs TB free. A nationwide assessment was conducted in 2024 & 2025 to evaluate TB free status across GPs, guided by key programmatic indicators.
Intervention or response: MoHFW and MoPR signed an MoU to pursue TB-free Panchayats, backed by a joint action plan and directives for state, district, and sub-district authorities. Training were conducted for rural officials on TB prevention, management, and the TB-free GP initiative, aiming for a coordinated action. A National Scientific Committee developed a standardized methodology based on six indicators, with trained teams conducting field assessments to validate TB-free status. Segregated data from calendar years 2023 & 2024 were analysed to assess GPs TB free status.
Results/Impact: Of 2.65 lakhs GPs, 21,973 for 2023 and 50137 for 2024 were eligible for TB free status which further underwent verification. Post-verification, 18281 GPs were declared TB-free in 2023 and 46,118 GPs in 2024. Notably, 9,539 GPs maintained TB-free status for two consecutive years. States with higher presumptive examination and over 90% notification targets achievement in 2023 and 2024 had significantly more TB-free GPs ($p<0.05$), indicating strong programmatic impact.
Conclusions: The assessment signifies a whole-of-Government and community-centered approach towards TB elimination, leveraging rural governance structures. By fostering ownership at the grassroot level, the initiative holds significant promise in accelerating TB burden reduction and advancing TB elimination goals in rural India.

EP61-1288-21 Enhancing TB case-holding through effective pre-treatment and continuous counselling in Delta State, Nigeria

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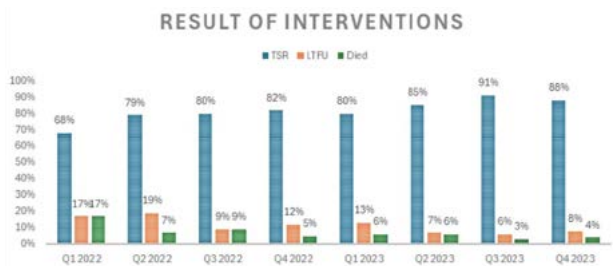
Background and challenges to implementation: Case holding remains a persistent challenge in tuberculosis (TB) control, with pre-treatment loss to follow-up (LTFU) and poor adherence contributing to suboptimal treatment outcomes. Structured counseling has been shown to improve treatment initiation, adherence, and success. This study evaluates the effectiveness of targeted counseling interventions on case-holding and treatment outcomes among TB patients in Delta State, Nigeria.
Intervention or response: Following a baseline assessment of healthcare workers' knowledge and skills, a capacity-building initiative was implemented targeting linkage coordinators and Directly Observed Treatment

(DOT) officers. Training was delivered virtually and reinforced through mentorship during supervisory visits. Interventions included enhanced pre-treatment and ongoing counseling, facilitated patient linkage to nearby treatment centers, and medication home delivery for select patients.

Strengthened collaboration with hospital-based and standalone laboratories improved acid-fast bacilli (AFB) monitoring, while TB/HIV co-infected patients were promptly initiated on antiretroviral therapy (ART). Monthly line lists supported systematic follow-up of patients due for AFB testing. Defaulters were tracked via phone calls and home visits to ensure adherence.

Results/Impact: The results of the intervention showed TSR was 68% in Q1 2022 and increased to 79% in Q2 2022 and 80% and 82%, respectively in Q3 & Q4 2022. In 2023, TSR dropped to 80% in Q1 2023 due to the resignation of the linkage coordinators, and new ones were recruited, but it increased to 85% in Q2 2023, 91% in Q3 2023, and 88% in Q4 2023, with a corresponding drop in LTFU and death rates.



Conclusions: Structured counseling interventions and active follow-up significantly enhance TB treatment outcomes. Strengthening case-holding at the point of diagnosis through skilled counseling, adherence support, and timely tracking—can reduce LTFU, minimize TB transmission, and improve survival.

Sustained investment in human resources and patient-centered care strategies remains essential to achieving national TB control targets.

EP62 M. tuberculosis infection and preventive treatment

EP62-1289-21 High TB infection rates in two rural districts of Ethiopia: Implications for enhanced TB preventive treatment

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Background: Understanding tuberculosis (TB) infection (TBI) rates is important for designing and implementing TB elimination strategies. However, there is limited empirical data on community-based TB infection (TBI). Our aim was to determine the prevalence of TBI among predominantly agrarian communities in two regions of Ethiopia.

Design/Methods: Between December 2023 and March 2024, we conducted community-based cross-sectional surveys in two rural districts, one each in Oromia and South Ethiopia regions. The districts were selected based on their high TB notification rates from routine reports. Using a multi-stage sampling method, sub-districts were randomly selected and within each sub-district sample size was allocated proportionally. We then collected blood samples from randomly selected participants using QuantiFERON blood collection tubes. *Mycobacterium tuberculosis* antigens-specific IFN-γ responses were measured from overnight stimulated whole blood samples using QFT-TB Gold Plus ELISA Kit, following the manufacturer's instruction.

Then the result was interpreted qualitatively as IGRA positive or negative. Multivariable logistic regression was used to determine factors associated with the outcome variable.

Results: Of the 1,052 study participants enrolled to the study 54.9% were females, and 42.9% were 25 to 44 years of age with the median age of 35 years. The overall prevalence of TBI was 46.8% (95% CI: 43.8%, 49.9 %). The odds of having TBI were higher among individuals living in the

district from Oromia versus South Ethiopia (AOR = *1.60 (1.24-2.08*; p < 0.001), in those aged 25-44 (AOR = 1.60 (1.15-2.23; p = 0.005), and in those who were overweight versus normal (AOR = 1.42(1.04-1.95; p = 0.03). TBI rates did not differ by sex.

Conclusions: Our results confirm high TBI rates in two Ethiopian agrarian communities as compared to the global rate of 24.8%, underscoring the need for enhancing availability and access to community wide screening and provision of TB preventive treatment.

EP62-1290-21 Prevalence of TB infection among household contacts aged 18 years and above of persons with pulmonary TB: A secondary analysis of Cy-TB test data from West Bengal, India

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Background: The National TB Prevalence Survey in India (2019-2021) estimated a Tuberculosis Infection (TBI) prevalence of 21.7% in individuals aged 15 years and older. The prevalence rate among the household contacts of pulmonary TB is higher. A recent study reported that 71% HHCs in India are TBI positive. Based on this evidence the national guidelines suggested to treat HHC of pulmonary TB as TBI with (Test & Treat policy) or without (Treat only policy) confirming the TBI. Till early 2024 the state of West Bengal followed the treat only policy.

After availability of the novel TBI tests know as Cy-TB the state adopted test & treat policy. Anecdotal evidence suggested that TBI positivity in the state might be lower than the estimates reported by studies elsewhere.

The study aimed to estimate the prevalence of TBI among different demographic group as well as the factors associated with TBI, if any.

Design/Methods: This is an observational study. A secondary analysis was done on the Cy-TB data of West Bengal.

Results:

- Overall TBI prevalence among above 18yrs old HHC of pulmonary TB was 14.7% (95% CI 13.5%-15.9%).
- TBI prevalence among adults (18-59yrs) was 14.9% whereas among elderly (60yrs or above) it was 13.5%.
- The TBI prevalence among male, female & transgender was 13.3%, 15.7% and 16.7% respectively.

No significant socio-demographic association was found with of TBI **(Fig-1)**

Fig- 1: Prevalence of TB infection (TBI) among above 18 yrs household contacts of person with pulmonary TB and the correlation with the sociodemographic factors during January to December 2024 in West Bengal, India n= 3583, n1= 3056, n2= 527 [N= n1+n2]

Sociodemographic parameters	Total N (%*)	TBI negative n1 (%#)	TBI positive n2 (%#)	p-value
Age group				
Adult (18-59 yrs)	3175 (88.6)	2703 (85.1)	472 (14.9)	0.457
Elderly (60 yrs & above)	408 (11.4)	353 (86.5)	55 (13.5)	
Gender				
Male	1451 (40.5)	1258 (86.7)	193 (13.3)	0.146
Female	2126 (59.3)	1793 (84.3)	333 (15.7)	
Transgender	6 (0.2)	5 (83.3)	1 (16.7)	
Comorbidity Status				
No comorbidity	3576 (99.8)	3051 (85.3)	525 (14.7)	0.300
Had comorbidity (HIV &/Diabetes)	7 (0.2)	5 (71.4)	2 (28.6)	

Notes: * column percentage (within the category); # Row percentage; Proportions & p-Value calculated with Chi square test.

Conclusions: TBI positivity in the state is lower than the estimates mentioned in the national guidelines. No risk factor was identified for the TBI positivity. Larger & robust studies may be conducted to confirm lower TBI prevalence in West Bengal.

EP62-1291-21 TB infections among rifampicin-resistant TB household contacts: A multi-central prospective cohort study (TCCT study)

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Background: Rifampicin-resistant tuberculosis (RR-TB) caused heavy burden on its patients and families. Aimed to prevent further transmission of RR-TB among families, this study monitored incidence and analyzed risk factors of tuberculosis infection of RR-TB household contact persons.

Design/Methods: This multi-central prospective cohort study (TCCT study, ClinicalTrials.gov: NCT04484129) recruited RR-TB close contact people with inclusion criteria as staying in the same house with index patients for more than 6 hours per week in 2 weeks preceding TB diagnosis. Interferon-gamma release assay (IGRA) or tuberculin skin test (TST) were implemented for tuberculosis infection (TBI) diagnosis. Sputum smear, culture, Xpert MTB/RIF and chest computed tomography (CT) examination were conducted for active TB (ATB) diagnosis. Generalized linear mixed models (GLMM) were established for infection risk factors analysis. All contact people would have an 18-month following-up observation of ATB development.

Results: Since May 2021, 435 RR-TB close contact people were enrolled. 219 were diagnosed with TB infections while 7 developed ATB (1 as RR-TB), with a TBI rate of 50.34% and ATB incidence of 1.35 per 100 person-years. The median time from index case RR-TB diagnosis to contact person ATB diagnosis was 57.5 days.

GLMM analysis showed male gender (*OR*=1.73, *95% CI* 1.03-2.91, *P*=0.038), low education level (*OR*=4.14, *95% CI* 1.40-12.26, *P*=0.033), abnormal chest CT (*OR*=2.01, *95% CI* 1.13-3.59, *P*=0.018), index patients with bilateral lung lesions (*OR*=3.42, *95% CI* 1.21-9.65, *P*=0.020) and positive sputum smear (*OR*=3.92, *95% CI* 1.42-10.85, *P*=0.023) increased TB infection risk.

Risk factors of TB infection among RR-TB close contact people.

Risk Factors	*Odds ratio (95% CI)*	*P* value
Contact Person Factors		
Male gender	1.73 (1.03-2.91)	0.038
Low education level		
(secondary education vs college degree or above)	2.33 (1.06-5.10)	0.033
(primary education vs college degree or above)	3.45 (1.42-8.39)	
(illiterate vs college degree or above)	4.14 (1.40-12.26)	
Abnormal chest CT	2.01 (1.13-3.59)	0.018
Index Case Factors		
Bilateral lung lesions vs unilateral lung lesions	3.42 (1.21-9.65)	0.020
Smear positive (1+ vs negative)	3.10 (1.23-7.78)	0.023
(2+ vs negative)	3.92 (1.42-10.85)	
(3+ vs negative)	3.29 (1.01-10.74)	
(4+ vs negative)	1.52 (0.53-4.32)	

Conclusions: RR-TB contact people had a high TB infection rate and developed ATB mostly within 3 months from index patient diagnosis. This study found TB infection risk factors for close contact people including male gender, low education level, abnormal chest CT, index patients with bilateral lung lesions and positive sputum smear, providing further preventive suggestions for RR-TB close contact people.

EP62-1292-21 Evaluation of TB infection prevention and control measures in China's designated medical institutions: A comparative analysis of 2014 and 2022

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Background: To assess the implementation of tuberculosis (TB) infection prevention and control (TB-IPC) measures in prefecture and higher-level TB-designated medical institutions and provide insights for further improvements.
Design/Methods: This study compared TB-IPC measures in TB-designated medical institutions using data from 2 questionnaire surveys conducted by Clinical Center on TB, Chinese Center for Disease Control and Prevention in 2014 and 2022, and evaluated progress over time.
Results: A total of 47 TB-designated medical institutions were analyzed, including 20 provincial institutions (42.6%) and 27 municipal institutions (57.4%). By 2022, IPC measures had significantly improved, with high consistency observed across regions, institutional levels, and hospital grades. Compared to 2014, 2022 showed significant increases ($P < 0.05$) in the establishment of dedicated pathways for patients and staff, separate wards for smear-positive and smear-negative pulmonary TB patients, dedicated wards for drug-resistant pulmonary TB patients. The use of air purification/filtration increased significantly ($P < 0.001$), with over 90% of institutions adopting natural ventilation and ultraviolet germicidal irradiation. The use of N95 masks by medical staff also increased significantly ($P<0.05$).
Conclusions: Significant improvements were observed in TB-IPC at TB-designated medical institutions in China between 2014 and 2022, and demonstrated rigorous compliance with TB-IPC standards.

EP62-1293-21 Impact of household TB contact investigation on detecting TB: TB-LON 3 project experience

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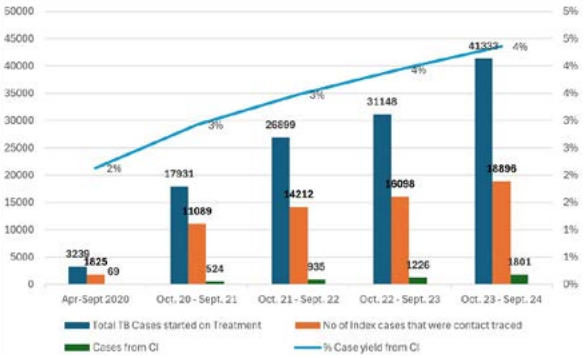
Background and challenges to implementation: Tuberculosis (TB) remains a major public health concern in Nigeria, ranked 6th among high-burden TB countries. Despite its potential, TB contact investigation (CI) is underutilized. CI plays a crucial role in detecting missed undiagnosed TB cases and curbing transmission, though its implementation faces challenges due to significant TB knowledge gaps and limited resources.
This paper highlights the outcomes of the TB-LON 3 project's CI from April 2020 to September 2024, addressing key implementation challenges and utilizing available resources.
Intervention or response: CI is a strategic method involving the assessment of household or close contacts of TB patients, leading to appropriate treatment for newly diagnosed cases or TB Preventive Treatment (TPT). It is conducted for bacteriologically confirmed TB cases. To overcome implementation challenges, the project adopted a multifaceted approach, including comprehensive training for healthcare workers, adaptation of guidelines & protocols, and community engagement to boost awareness and involvement. TB-LON 3 project is implemented across Lagos, Ogun, Osun, and Oyo states in Southwest Nigeria.

Results/Impact: Between April 2020 and September 2024, 127,204 TB cases were diagnosed, with 120,550 initiated on treatment. Of these, 102,373 were bacteriologically confirmed, and 62,120 had their contacts traced.
Among 266,008 contacts identified, 265,749 were screened, yielding 4,555 TB cases (4,121 bacteriologically confirmed) and 4,380 began treatment consisting of 2,091 females and 2,289 males. CI cases rose from 69 in 2020 to 1,801 in 2024—a 2,600% increase—now contributing over 4% of all TB cases, despite tracing about 50% of index cases.
Additionally, 197,043 contacts were eligible for TPT, with 33% enrolled. Without CI, many cases would remain undiagnosed or detected late, increasing community spread.



Conclusions: CI remains a valuable yet underused strategy for TB detection in Nigeria. Addressing implementation barriers and optimizing resources can enhance early diagnosis and care, ultimately lowering TB-related illness and death. Programs should prioritize CI funding.

EP62-1294-21 Revisiting index contact households: Evidence for structured repeat testing among TB contacts in Khana LGA, Rivers state Nigeria

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Background: Contact tracing is vital in tuberculosis (TB) control, yet a single round of testing may fail to capture cases that manifest later due to reactivation or reinfection. In Khana LGA, Rivers State, Nigeria, emerging TB cases within previously traced households years after initial investigations highlight the limitations of one-time screening, particularly in high-burden, resource-constrained settings.
Design/Methods: A retrospective analysis was conducted using TB registers, household interviews, and case reviews from 2020 to 2025. The study assessed initial contact tracing outcomes, follow-up gaps, and the timing and nature of newly diagnosed TB cases in previously screened households. Outcomes were benchmarked against WHO's evolving guidelines for systematic screening in TB-endemic regions.
Results: Among two index households traced in 2020 and 2022, five new TB cases were diagnosed between 2022 and 2025. Of 40 household contacts initially screened, only 12 (30%) underwent any follow-up before 2025.
Notably, 16 new cases emerged, with 40% identified only after symptom onset. Absence of structured re-screening, symptom normalization, and healthcare access barriers contributed to delayed diagnoses.
Importantly, no digital tracking or scheduled re-evaluations were employed.
Background and challenges to implementation: Contact tracing is vital in tuberculosis (TB) control, yet a single round of testing may fail to capture cases that manifest later due to reactivation or reinfection. A retrospective analysis was conducted using TB registers, household interviews, and case reviews from 2020 to 2025. The study assessed initial contact tracing outcomes, follow-up gaps.

Challenges that may arise can be attributed to lost- to follow up and migration of people from rural areas to urban and vice versa.

Results/Impact: Among two index households traced in 2020 and 2022, five new TB cases were diagnosed between 2022 and 2025. Of 40 household contacts initially screened, only 12 (30%) underwent any follow-up before 2025.

Notably, 16 new cases emerged, with 40% identified only after symptom onset. Absence of structured re-screening, symptom normalization, and healthcare access barriers contributed to delayed diagnoses.

Importantly, no digital tracking or scheduled re-evaluations were employed.

Conclusions: The findings underscore the critical need for repeat testing at 9 and 12 months post-exposure to capture delayed TB onset. This timing aligns with the completion of TB preventive therapy (TPT) and enables early detection among high-risk individuals.

To reduce household transmission and undiagnosed TB burden, national programs must institutionalize structured follow-up protocols, enhance TB awareness, and explore the integration of digital tools for longitudinal contact surveillance.

EP62-1295-21 Finding the missing people with TB through expanded public-private mix (PPM) engagement in Lagos State, Nigeria

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Background and challenges to implementation: Lagos State, one of the most densely populated cities in Nigeria, accounts for approximately 8.4% to 11% of the country's TB burden. The busy city has over 5,000 registered private healthcare facilities. Surveys show that between 50% and 70% of the population (Guy S., Hannah M.D., Madhukar P., 2021) seek healthcare services from private facilities. However, as of 2021, the number of private facilities engaged in TB care in Lagos was still limited compared to the total pool of private healthcare providers. This paper presents how Public-Private Mix (PPM) expansion efforts have helped to find missing TB cases in Lagos State between 2019 to 2024.

Intervention or response: In 2022, the TBLON 3 project, implemented by the Institute of Human Virology Nigeria (IHVN) through the intermediary organization Loving Gaze, expanded the scope of private healthcare facilities engagement and included informal care providers. Advocacy visits and stakeholders' engagement were conducted to reach out to facilities not previously involved in the TB program. On-the-job training was also provided for these facilities. Those not previously part of the TB program, referred to as 'linked facilities,' began referring their samples or cases to Lagos state tuberculosis and leprosy control program (LSTBLCP) facilities (hubs) for evaluation, data entry and treatment.

Results/Impact: Over 130 linked private facilities across 21 LGAs in Lagos state were brought into the TB program. Diagnosed TB cases rose from 3433 in 2019 to 4316 in 2024. The total cases from linked facilities within the period under review was 3659.

S/no	Year	Cases diagnosed from linked facilities	Cases diagnosed from LSTBLCP engaged facilities	Total
1	2019	0	3433	3433
2	2020	0	3113	3113
3	2021	0	3724	3724
4	2022	973	3076	4049
5	2023	1178	3218	4396
6	2024	1508	2808	4316

Conclusions: Private facilities should not be restricted to private hospitals and clinics but should also include patent proprietary medicine vendors, traditional birth attendants, community pharmacies, and standalone laboratories. Therefore, to achieve a high level of commitment to ending TB by 2030 requires scaling up comprehensive strategies to enhance the expansion and collaboration of the PPM network.

EP62-1296-21 Treatment uptake among people with TB infection detected by community-based screening in rural Vietnam

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Background: The primary purpose of testing for, and treating, latent tuberculosis infection (LTBI) is secondary prevention of TB: that is, preventing progression to active TB in those who have been infected. If implemented as a community-wide intervention, it may accelerate progress towards TB elimination. The effectiveness of this intervention is, in part, dependent upon the willingness of people who are diagnosed with LBTI to accept treatment. Evidence from a previous study of mass-screening for latent TB infection found screened individuals complied poorly with preventive therapy, limiting the epidemiological impact of the intervention (1). We sought to establish whether higher levels of acceptance could be achieved in Ca Mau, Vietnam.
Design/Methods: We conducted a household survey of all adults living in 104 randomly selected villages in the rural province of Ca Mau in Vietnam and screened all consenting eligible people (age 5 and above). Those who were TST positive, in whom active TB was excluded, and who had no contraindications to treatment were recommended for treatment with isoniazid and rifapentine once weekly in twelve weeks (3HP). The medication was dispensed weekly by study staff who also used a symptom checklist for early detection of adverse drug reactions.
Results: *Progression from screening to commencing treatment for TBI*

Consented to screening	72, 341
TST Positive	24, 286 (33,6%)
Attended for further assessment	21, 084 (86.7% of those TST +ve)
Excluded (active TB)	224
Recommended to commence treatment for TBI	18, 745 (88.9% of those who complete assessment)
Received first dose of 3HP	13241 (70.6% of those recommended for treatment)
Complete TBI treatment (12 doses)	6321 (47.7% of those took first dose)

Conclusions: Overall, a high proportion of people diagnosed with TBI during community-wide screening commenced treatment for TBI. Failure to attend for further assessment was the major reason for non-commencement of treatment.

EP62-1297-21 Digital health interventions in improving initiation and completion of TB preventive treatment among household contacts: A systematic review and meta-analysis

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Background: Tuberculosis preventive treatment is one of the key strategies to reduce TB transmission and disease progression to more advanced states. However, there is limited evidence on the effect of digital interventions on TB preventive treatment completion. Therefore, we aimed to investigate the current literature on the effectiveness of digital interventions in improving tuberculosis preventive treatment initiation and completion.
Design/Methods: A Systematic Review and Meta-analysis were conducted adhering to the Preferred Reporting Items for Systematic Reviews and meta-analysis guidelines. The eligible articles were; fulfilled population, intervention, comparison, and outcome criteria written in the English language starting from 1990, and which were conducted globally sourced from PubMed, Scopus, Cochrane, and Science Direct databases. Data were extracted based on Cochran's data collection recommendations. Two independent reviewers were assessed quality by the revised Cochrane risk of bias tool. Data synthesis and Meta-analysis were performed using Stata version 17. The random effect model was used to assess the effect of intervention as there was significant heterogeneity between the studies.
Results: Of 2214 articles identified 29 were included in full text screening after removing duplicates and irrelevant studies. Finally, 4 articles were included in systematic review and meta-analysis. A total of 1800 participants were included in this study. All studies assessed preventive therapy completion but none of them assessed its initiation. The pooled odds ratio was 0.74(95% CI: 0.43, 1.28) and there is substantial heterogeneity (I^2=66.14%) but had no publication bias (egger test=0.2612).
Conclusions: A limited number of studies explore the effect of digital interventions in improving TPT initiation and completion. The available evidence suggests the potential role of digital interventions in improving TPT initiation and completion when directly observed therapy was not feasible. This highlights the need for further studies of digital interventions to improve TPT initiation and completion rates.

EP62-1298-21 Strengthening TB diagnosis and preventive treatment from a global and Bangladesh perspective following UNHLM commitments

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Background and challenges to implementation: Tuberculosis (TB) remains a major global health threat, responsible for approximately 1.25 million deaths annually, with low- and middle-income countries (LMICs) bearing the highest burden. A particularly vulnerable group includes household contacts of TB patients, especially children under five, among whom infection rates can reach 72% in high-burden settings.
A critical barrier to TB elimination is the management of tuberculosis infection (TBI)—a latent and asymptomatic condition affecting around 1.7 billion people worldwide. Without treatment, 5–10% of individuals with TBI may progress to active TB, making effective screening and timely tuberculosis preventive treatment (TPT) essential. Despite WHO guidelines, progress has been slow, with challenges such as limited diagnostic infrastructure, resource constraints, and disruptions from the COVID-19 pandemic impeding implementation.
Intervention or response: This study assessed the global and Bangladesh-specific progress toward TPT scale-up using secondary data from WHO and United Nations High-Level Meetings (UNHLM) on TB (2018 and 2023). It also reviewed innovative diagnostic tools, including Cy-Tb, a novel test piloted in Bangladesh by icddr,b, for their applicability in LMIC contexts.
Results/Impact: Globally, only 10% of the TPT target for household contacts was achieved by 2022. In Bangladesh, the National Tuberculosis Program (NTP) reached just 37% of its target, initiating TPT in 437,000 of 1.17 million identified contacts between 2018 and 2023. The gap underscores the pressing need for scalable, affordable, and accurate TBI diagnostic tools and better integration of TPT into routine health services.
Conclusions: To meet the 2023 UNHLM target of enrolling 30 million household contacts by 2027, countries like Bangladesh must accelerate TPT scale-up through enhanced surveillance, innovative diagnostics, and policy alignment. Sustained investment, operational research, and multi-sectoral collaboration are pivotal to achieving TB elimination goals by 2030.

EP63 TB uncovered: Advocacy and awareness in action

EP63-1299-21 Empowering mothers of children living with HIV to promote TB preventive therapy: A community-based approach in high-burden districts of Sindh, Pakistan

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Background and challenges to implementation: In Sindh province, Pakistan, HIV outbreaks in four high-burden districts exposed over 1,500 individuals, including a significant number of women and children, to co-infection risks. These communities face multiple layers of vulnerability, including poverty, low literacy, stigma, and limited access to healthcare services. Despite the known benefits of TB preventive therapy (TPT), particularly for children living with HIV, awareness and uptake of Isoniazid Preventive Therapy (INH) remained critically low. Social taboos, poor health-seeking behaviours, and lack of gender-responsive programming further hindered access to integrated TB-HIV care.
Intervention or response: Bridge Consultants Foundation (BCF) launched a project titled *„Fostering Participation and Empowerment of Women and Girls in TB Initiatives"* to strengthen community engagement and improve access to TB services through a gender-focused lens. One core activity involved the formation and training of support groups comprised of mothers and fathers of HIV-positive children. These groups were capacitated to understand the risks of TB, the benefits of TPT, and the importance of regular screening.
Special emphasis was placed on empowering mothers to take the lead in ensuring their children's TB-related healthcare needs were met.
Results/Impact: Support groups trained under the project actively mobilized over 600 HIV-affected families, leading to increased referrals for TB screening and a threefold rise in IPT uptake among children living with HIV. Women participants reported increased awareness, confidence, and engagement with local health services. The initiative also contributed to improved coordination between HIV and TB programs at the local level.
Conclusions: Empowering women—particularly mothers of HIV-positive children—is a powerful strategy to address TB-HIV co-infection risks in marginalized settings. Community-driven, gender-responsive models can transform health outcomes and ensure equitable access to TB prevention and care

EP63-1300-21 From villages to victory: Empowering PRIs to declare TB Mukt Gram Panchayats in Moga District, Punjab (A scalable model for India)

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Background and challenges to implementation: Panchayati Raj Institutions (PRIs) form the backbone of rural governance in India, with immense potential to influence and implement health interventions at the grassroots level. However, their role in tuberculosis (TB) elimination has been largely underutilized. To address this gap, the Integrated Measures for Prevention and Care in TB (IMPACT)-India Project, supported by The Global Fund, is being implemented by TB Alert India as a sub-recipient of KHPT in Moga district, Punjab, a Pradhan Mantri Aspirational District. The initiative aims to institutionalize PRI participation in the National TB Elimination Program (NTEP).
Intervention or response: The IMPACT-India project recruited seven dedicated Community Coordinators (CCs) for Moga and provided technical support across state of Punjab. Each CC has spearhead project initiatives across 45–50 Gram Panchayats (GPs), ensuring active participation from PRIs. By end of 2024, 175 (51% of 340 GPs) were oriented on TB awareness, early diagnosis, stigma reduction, and welfare schemes like Nikshay Poshan Yojana. PRI leaders organized campaigns, facilitated contact tracing, and collaborated with TB Champions and Ayushman Arogya Kendras. Special Gram Sabhas (village-level assemblies in India) on TB encouraged Panchayats to pass TB-Free resolutions
Results/Impact: By December 2024, Punjab's state average of TB-Free Gram Panchayats (GPs) rose significantly from 0.05% in 2023 to 4% (495 out of 13,052), a joint effort driven by NTEP and the IMPACT-India Project. In Moga, 77 GPs (23% out of 340) were declared TB-Free, which is six times higher than the state average, facilitated by localized political will, structured PRI training, community-driven action, and the efforts of Community Coordinators (CCs), enhancing TB awareness, referrals, and treatment adherence.
Conclusions: The Moga model demonstrates a scalable approach for integrating PRIs into NTEP. By empowering grassroots leadership with knowledge and resources, it accelerated TB elimination, offering a replicable strategy for high-burden districts and aspirational districts aiming for equitable health outcomes.

EP63-1301-21 HIV and TB are not the same: Rethinking how to tailor community engagement for TB

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Background and challenges to implementation: Actively engaging communities in shaping discussions and decisions—known as community engagement (CE)—is increasingly seen as vital to support the acceptability, uptake, and effectiveness of public health responses. Yet Tuberculosis (TB) CE remains fragmented and underfunded. Unlike HIV, which has fostered strong community identities and sustained advocacy, TB CE is often transient, ending with treatment completion. Challenges include the absence of a unified TB community, an episodic disease trajectory, and historically lower investment.
Current upheavals in global health, including cuts to long-standing international aid, threaten emerging CE efforts and highlight the need to reimagine strategies that center communities and sustain their influence.
Intervention or response: To understand these challenges, we facilitated discussions with CE experts and practitioners to explore how HIV CE's success—driven by strong networks, advocacy, and community-led governance—could be adapted to meet TB affected communities' specific contextual conditions and inform approaches to TB CE.
Results/Impact: Historically, the emphasis on TB control has left little room for CE. Redressing this requires a strong commitment to affording TB affected communities, through CE, both more space and power to influence the strategic direction of TB efforts.
Findings underscore the need for CE strategies that extend beyond research-driven models to become integral to national TB programs.
While some elements of HIV CE, such as long-term advocacy and community leadership, can be adapted, its salience has been over-estimated, and TB CE requires context- and disease-specific approaches. CE initiatives in TB-affected communities demonstrated that nurturing the unique shared TB survivorship identity is key to enhancing long-term engagement and advocacy.
Conclusions: TB CE must move beyond short-term, project-based models to sustained, community-led engagement. National TB programs should integrate survivor networks and invest in long-term advocacy.
Future efforts must prioritize strengthening TB community identity, leadership structures, and embedding CE into TB policy and programs.

EP63-1302-21 Empowering TB survivor-led networks in India to adopt CRGS approaches

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Background and challenges to implementation: India's National Strategic Plan for TB elimination has incorporated several key dimensions of Communities, Rights, Gender and Stigma (CRGS). While understanding of CRGS principles is strong at the policy level, this is yet to percolate within communities, where both understanding and uptake remain more uneven.
In recent years, TB survivors and Champions have organised themselves as independent networks representing affected communities and advocating on their behalf. These networks are ideally positioned to adopt and promote CRGS strategies.
Intervention or response: The objective of this intervention was to build the capacity of TB survivor-led Networks on CRGS principles and tools and enhance their expertise to generate effective demand for equitable TB services. A comprehensive CRGS curriculum was developed, and network leaders from six state-level networks (Bihar, Chhattisgarh, Odisha, Uttar Pradesh, Uttarakhand, Tamil Nadu) were trained through in-person workshops.
Post training, trained network members undertook specific CRGS activities over a six-month period, focusing on different aspects of CRGS – outreach to transgender communities, mapping of local key and vulnerable populations (KVPs), stigma surveys in the community etc.
Results/Impact: Through this intervention, 108 network leaders from six states were trained and led the development of annual CRGS workplans for their respective networks, also sensitising over 1000 other members. They educated over 6000 individuals from KVPs - migrant poor, miners, urban slum dwellers, tribal and rural populations, construction workers, transmen and transwomen, prisoners etc. Based on the KVP prioritisation, they interviewed over 450 people from KVPs to understand specific barriers to health services.
Overall, network members sensitised 15,117 people on TB and CRGS through 1100 meetings.
Conclusions: While the TB Champion model is well entrenched in India, this intervention has established CRGS as a guiding principle for networks. In the long term, investment in building community-capacity on CRGS is essential to generate collective demand for more inclusive TB services.

EP63-1303-21 Coalition-driven advocacy to improve access to TB medicines in Canada: Using provider perspectives to create change

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Background and challenges to implementation: Despite the recent development and availability of shorter, safer and all oral tuberculosis (TB) treatment regimens, key first and second line TB drugs remain difficult to access in Canada. Years of advocacy by the Canadian TB community have had little effect, indicating the need for new evidence-based strategies.
Intervention or response: In 2024, Stop TB Canada undertook a national survey of TB program staff and healthcare providers across 10 provinces and territories. The goal was to document access barriers, amplify provider experiences, and build a coalition for change. Using a mixed-methods design, the survey gathered quantitative data on drug availability and delays, alongside qualitative insights into clinical impacts.
The findings were compiled into a publicly released advocacy report. This report became a tool to convene a range of stakeholders, including the Public Health Agency of Canada, Indigenous Services Canada, and Health Canada.
Results/Impact: The survey received 71 responses and revealed systemic access delays, insufficient regulatory mechanisms, and lack of child-friendly TB drug formulations. The report's publication triggered a national conversation, resulting in a series of high-level meetings with government actors and regulators. The coalition broadened through engagement with affected communities and professional networks.
As a direct outcome of the advocacy, new pathways are now being explored to improve access to WHO-recommended TB medicines and pediatric formulations through streamlined regulatory approaches and centralized procurement.
Conclusions: This initiative demonstrates how provider-informed data, when combined with coalition-led advocacy, can generate policy momentum. It presents a scalable model for engaging health professionals, affected

communities, and policymakers in high-income countries facing similar access barriers. Ongoing collaboration is now focused on translating progress into sustained regulatory reform and improved equity in TB care.

EP63-1304-21 Eliminating barriers to TB care: Lessons from the 100-day intensified TB elimination campaign in remote tribal areas of Arunachal Pradesh, India (Dec 2024-Mar 2025)

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Background and challenges to implementation: The 100-Day Intensified TB Elimination Campaign in Kurung Kumey and Kra Daadi districts, Arunachal Pradesh, showcases a targeted approach to delivering equitable TB care to underserved, hard-to-reach areas. Despite challenges like landslides, inaccessible roads, and unreliable electricity and connectivity, the campaign reached vulnerable populations in the remotest regions.

Intervention or response: The state mobilized resources, including handheld X-rays, Nikshay Vahans (Mobile Medical Units), and additional NAAT (Nucleic Acid Amplification Test) machines, ensuring diagnostic capabilities in challenging terrains. Teams travelled at the break of dawn to reach villages like Kapu—one of the last hamlets near the Indo-China border—ensuring last-mile service delivery.

The campaign mapped vulnerabilities in a population of over 1.13 lacs, conducted 118 Nikshay Shivirs (integrated health camps) and screened 7,404 (100%) vulnerable individuals.

Alternate communication strategies and portable power solutions were deployed to address operational challenges. Collaborative efforts involved local government support, PRI member engagement, developmental partners, mobilization through women's self-help groups and schools to amplify awareness and participation.

Results/Impact: The campaign identified 3,140 persons with presumed TB, of whom 72% underwent X-ray screening, with 90% of the tests being NAAT-based, which detected 4 PwTB (Persons with Tuberculosis).

Key achievements included addressing TB determinants in tribal population, transitioning to 100% upfront NAAT testing, early detection of PwTB, and distribution of nutritional support through Nikshay Poshan Yojana (Financial support for nutritional needs) and Nutritional baskets. The success was reflected in increased TB Mukt Panchayat (TB-Free Village) claims and adoption of PwTB by Nikshay Mitras (Donors).

Conclusions: The 100-Day campaign in Arunachal Pradesh demonstrates that even in remote, resource-limited settings, strategic planning, innovative solutions, and strong ownership by community and public representatives can overcome barriers to TB care. It highlights the importance of integrating programmatic activities and fostering multi-sectoral collaboration, transforming campaign activities into sustainable practices and offering valuable insights for global replication.

EP63-1305-21 Evidence based advocacy to enhancing integrated TB and HIV service provision among persons with disabilities (PWDs) in Uganda

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Background and challenges to implementation: PWDs face significant barriers in accessing equitable HIV/TB services, leading to poorer health outcomes. In Uganda, an estimated 13.2 % of the population live with disability, and about 96,000 people fall ill to TB annually.

Intervention or response: To address this, ADPHA Uganda conducted an accessibility study in eight health facilities across Greater Masaka to identify barriers and promote disability-inclusive TB/HIV services. Using a mixed-methods approach, the study combined a literature review, stakeholder mapping, interviews, focus group discussions with quantitative methods. Findings were analysed and validated.

An advocacy strategy was formulated to promote disability-inclusive services, ensuring reasonable accommodations, and monitoring the physical accessibility of health facilities. This aimed to ensure PWDs. can confidently access services through the implementation of local legislation, training peer monitors, and advancing universal design principles in line with CRPD Article 25, SDG 3 and UNHLM targets.

Results/Impact: The study revealed that while all assessed facilities provide TB and HIV/AIDS services per national guidelines, none had institutionalised strategies to address the intersection of disability,TB, and HIV/AIDS. Disability rehabilitative services were not integrated, and essential assistive devices were excluded from care packages. Facilities lacked systematised reasonable accommodations, especially for people with invisible disabilities.
Poor infrastructure, inaccessible latrines, fragmented service points, and economic barriers further limited access, undermining CRPD Article 25, and efforts to achieve SDG 3. PWDs also faced stigma, inadequate service provision, awareness, exclusion from health promotion efforts and preventive services.
Conclusions: There is a critical need of strengthening integrated TB and HIV service provision for PWDs. This requires institutional reforms, budget allocations, inclusive planning, disability-sensitive data, and Multisectoral collaboration with OPDs to institutionalise reasonable accommodations and universal design.

EP63-1306-21 Empowering TB survivors as champions of change: A community-led approach to advancing TB elimination efforts in India

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Background and challenges to implementation: India has made substantial strides toward eliminating tuberculosis through sustained government initiatives. However, challenges such as limited awareness, delays in diagnosis, and challenges within the care continuum continue to impact progress.
Addressing stigma and enhancing community engagement remain critical to strengthening the response and accelerating TB elimination.
Intervention or response: The IMPACT India Project, supported by the Global Fund, addressed key challenges by empowering TB survivors to volunteer as advocates for TB prevention and care. Trained as "TB Vijetas" (Champions), they were placed at Ayushman Arogya Mandirs (AAMs)—the lowest-level health facilities serving ~5,000 people.
These Vijetas voluntarily led outreach, raised awareness, and provided peer support, integrating their advocacy within existing AAM infrastructure to promote early TB detection and treatment completion.
Results/Impact: October 2024 to March 2025, the project reached out to 19,249 TB survivors across 99 districts in 15 states, training 11,305 as Vijetas for voluntary community engagement activities in TB response. Of this over 70% (63% male, 37% female) were actively engaged in carrying out 19,305 community engagement activities. NTEP reported 14,611 more TB notifications in project districts compared to the same period last year. The project also strengthened community ownership, enhanced support mechanisms, and increased grassroots awareness.
Importantly, Female Vijetas (3,047) played a key role in raising awareness and promoting health-seeking behaviour, particularly in rural settings where TB stigma intersects with gender-related barriers. They led 6,704 engagement sessions at 3,593 AAMs, promoting inclusion and community support.
Conclusions: The IMPACT India Project illustrates how empowering TB survivors as volunteer champions can drive meaningful, community-led change. Their leadership in awareness, support, and stigma reduction reflects the transformative power of lived experience in advancing TB elimination.
This approach not only strengthens grassroots engagement but also lays the foundation for scalable, sustainable integration of survivor-led efforts into the broader health system.

EP63-1307-21 Utilising the 'Duare Sarkar' (Government at doorstep) camp for TB information, education and communication, as well as screening: Outputs of such a camp in a district of West Bengal, India

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Background and challenges to implementation: 'Duare Sarkar' is an initiative of the Government of West Bengal, for delivery of services and welfare schemes at the doorsteps of the people through outreach camps. These camps are organized at the gram panchayat and municipal ward level. District Health authorities utilise these opportunities and arrange Health Camps to disseminate health related information, arrange screening and treatment camps for Communicable and non-communicable diseases including Tuberculosis.
Intervention or response: The Paschim Medinipur, a rural district having significant proportion of tribal population used this opportunity to organize IEC (Information Education and Communication) activities and health

camps for screening and treatment of Tuberculosis involving health care providers of the blocks and municipalities beyond the NTEP (National TB Elimination Programme) personnel. They established a collaboration with the general administration & panchayat raj institution to mobilize fund for additional nutrition of the Person with TB (PwTB).

Results/Impact:

- In 30 days, a total of 485 Duare Sakar camps arranged at Paschim Medinipur
- Total 16,221 people visited the health kiosk and received TB messages
- Total 10,214 people screened for TB
- 255 persons presumed to be TB & referred for Testing
- Four persons with TB diagnosed
- 50 existing PwTB received food basket through 11 identified Nikshay Mitras (donor) during the camp.
- People were also screened for diabetes, hypertension, cataract, oral cancer etc.

Conclusions: Arranging health camps especially TB screening & IEC activities during the Duare Sarkar Camp was a positive initiative in terms of diagnosis of additional number of PwTB and Nikshay Mitra (donors) for additional nutrition for the PwTBs.

EP63-1308-21 EduClowns for TB awareness: Creative community engagement for early detection and behavioural change in Tamil Nadu, India

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Background and challenges to implementation: Blossom Trust has implemented EduClowns an innovative approach aimed at identifying community members, particularly in marginalised and remote communities in rural Tamil Nadu, where under resourcing has led to misinformation, stigma and poor health-seeking behaviours that hinder the detection and care of Tuberculosis (TB). EduClowns uses theatre-based performances to engage communities, raising awareness on TB, sexual health, and universal health coverage.

Over three decades, more than 100 shows across Virudhunagar, Madurai, and Kanchipuram have supported TB awareness and community engagement.

Intervention or response: In 2024, the *EduClowns Campaign for the Prevention of Tuberculosis* (ECPT) was launched under the USAID-funded TIFA programme, in collaboration with NTEP and JSI. Aimed at bringing about behavioural change regarding TB and improve community detection and treatment adherence.

The campaign combined performances with on-site TB education, screening, and referrals. It aimed to reach 8,000 people, screen 1,800, and refer 90% of symptomatic individuals for testing. Planned outreach included 40 campaigns in 58 villages across Virudhunagar and Ramanathapuram. Although the campaign was suspended due to U.S. policy changes, the model showcased a community-led, stigma-reducing approach to TB detection and care.

Results/Impact: While ECPT was not fully implemented, Blossom Trust's previous EduClowns campaigns have successfully reached hundreds of thousands in communities across Tamil Nadu and demonstrated the potential for behaviour change. EduClowns have also drawn the attention of both local community and policymakers, influencing local and state-level health initiatives.

Conclusions: EduClowns is a scalable, culturally relevant strategy for TB advocacy, demonstrating how civil society can strengthen health systems and reduce health disparities in diverse communities. The model holds significant potential for adaptation to broader health interventions. Future implementation of the model can lead to increased TB awareness, early detection, and stronger referral pathways, improving overall TB care in target communities.

LATE BREAKER PRESENTATIONS

LB01 RIT/JATA Student Late Breaker Session on Lung Health

LB01-1300-18 Management of people with positive TB infection tests: Thinking in 4 dimensions

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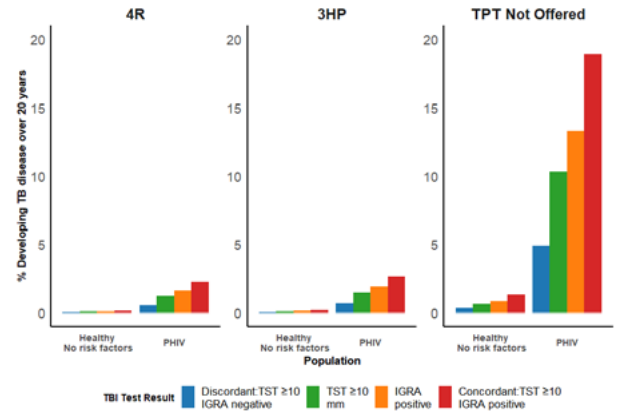
Background: When managing a positive TB infection (TBI) test, providers often focus solely on the test result. Yet individual benefit also depends on clinical context, age, and the preventive regimen. We used a Markov microsimulation model to evaluate 20-year risks and benefits of TPT in numerous populations and age groups with at least one positive TBI test.
Design/Methods: We considered four dimensions: (1) population risk group (20 groups, including healthy individuals and persons with HIV [PHIV]); (2) TPT regimen (3HP, 3HR, 4R, 9H, or no treatment); (3) age group; and (4) test result: TST ≥10 mm only, IGRA-positive only, TST ≥10 mm & IGRA-negative, or TST ≥10 mm & IGRA-positive. For each group, a cohort of 10,000 persons was simulated 1,000 times to generate 95% uncertainty intervals. Outcomes included TB-incidence, TB-related mortality and disability, TPT-related adverse events, and QALYs.
Results: We present findings for two risk groups (PHIV and healthy individuals), one age group (18–34 years), and three TPT scenarios (no treatment, 3HP, 4R) (Figure). Among untreated PHIV and healthy persons, TB risk was 10.3% (0.4–31.7) and 0.8% (0–3.0) for TST ≥10 mm only, respectively. 4R substantially reduced TB risk across test categories and had the lowest adverse event rates (1.7%–4.1%).
While TB risk decreased with discordant tests, and increased with concordant positive tests, differences between tests were modest compared to differences between risk groups. For example, among untreated PHIV, risk was 13.3% (0.5–40.9) for IGRA-positive only and 18.9% (17.8–20.0) for dual-positive, compared to 0.8% and 1.3%, respectively, among healthy individuals. Among adults >65 years, TB risk was lower, but TB-related mortality higher, resulting in larger QALY gains from TPT.



Conclusions: Individual risk factors—such as age and underlying condition—are more important than test type in determining TB risk and TPT benefit and should guide provider decision-making.

LB01-1301-18 Improving M. tuberculosis DNA detection from urine and non-sputum sample using the QuickConc method: Preliminary results from a spike-in experiment

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Background: Urine- and other non-sputum (e.g., pleural fluid, cerebrospinal fluid)-based molecular diagnostics offer potentially more effective alternative to conventional methods; however, detecting *Mycobacterium tuberculosis* (MTB) DNA remains challenging due to its low concentration. QuickConc (AdvanSentinel, Japan), a novel concentration method originally developed for environmental DNA research and wastewater surveillance, utilizes silica-glass fibers and a cationic surfactant to capture nucleic acids and improve downstream molecular detection.
While QuickConc has demonstrated efficacy in concentrating nucleic acids from environmental samples, its application to MTB detection or clinical sample has not yet been explored. This study aimed to evaluate the analytical performance of QuickConc for enhancing MTB DNA detection in urine.
Design/Methods: DNA was extracted from the H37Rv strain of MTB cultured in Löwenstein–Jensen medium using DNeasy Blood & Tissue Kit (QIAGEN) and subsequently spiked into urine samples from healthy individuals. A spike-in experiment was performed using MTB DNA at two concentration levels (10^8 and 10^7 copies/mL). Samples were either processed using the QuickConc concentration method or left unprocessed as controls. Conventional PCR targeting the IS6110 gene (123 bp amplicon) was performed, and PCR products were analyzed via agarose gel electrophoresis.

Results: QuickConc-treated samples showed PCR amplification at 10^8 copies/mL, and detectable though weaker band at 10^7copies/mL.
In contrast, unprocessed samples produced only faint bands at 10^8 copies/mL and no detectable band at 10^7copies/mL (Figure). The QuickConc method improved the limit of detection and the amplification band intensity.

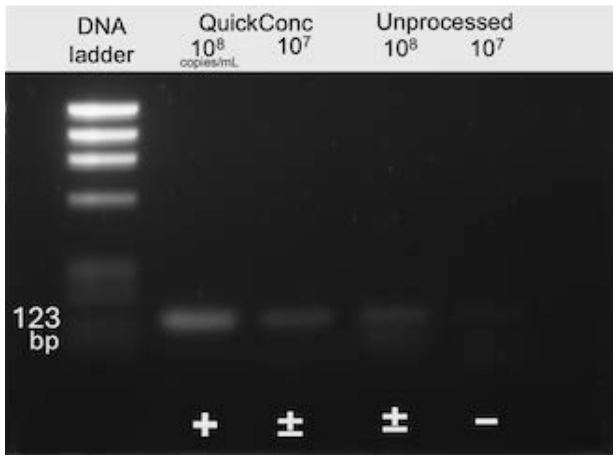

Figure.

Conclusions: Under preliminary conditions, the QuickConc method enhanced MTB DNA detection from urine by effectively concentrating target DNA, highlighting its potential as a sample preparation step for molecular diagnostics using urine and non-sputum sample. Further optimization and validation using clinical samples are currently underway.

LB01-1302-18 Potent inhibition of wild-type and fluoroquinolone-resistant *M.avium* DNA gyrase by sitafloxacin and DC159a

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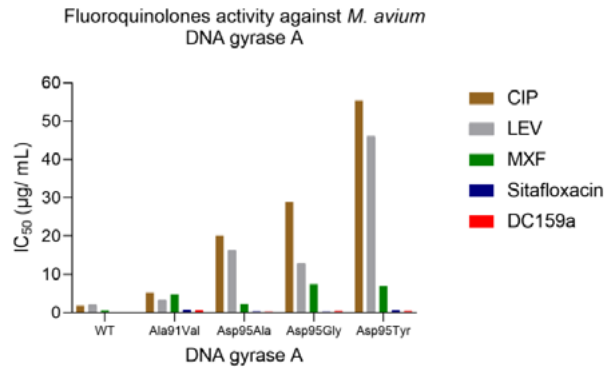
Background: *Mycobacterium avium* is an opportunistic pathogen belonging to the *Mycobacterium avium* complex (MAC) that causes chronic pulmonary infections. Moxifloxacin, a fluoroquinolone, is a recommended second-line treatment for MAC infections. Resistance to moxifloxacin is becoming more widespread. Sitafloxacin is a therapeutically accessible fluoroquinolone in Japan, while DC159a is a new experimental fluoroquinolone with strong potency against resistant bacteria. However, studies regarding their activity against *M. avium* are rare.
Design/Methods: We investigated the inhibitory effects of sitafloxacin and DC159a on recombinant *M. avium* DNA gyrase A and B wild-type (WT) and gyrase A mutants Ala91Val, Asp95Ala, Asp95Gly, and Asp95Tyr, using a DNA supercoiling inhibitory assay to calculate the half inhibitory concentration (IC_{50}).
The minimum inhibitory concentration (MIC) of DC159a and sitafloxacin was determined for 11 clinical isolates (7WT, 2Asp95Gly, 2Asp95Tyr) and compared with previously tested MICs of moxifloxacin, ciprofloxacin, and levofloxacin.
Results: Sitafloxacin and DC159a inhibited both WT and mutant DNA gyrase A in a dose-dependent manner. The IC_{50} values of sitafloxacin against DNA gyrase A were 0.132 ± 0.02 μg/mL for WT and 1.061 ± 0.3, 0.738 ± 0.06, 0.597 ± 0.08, and 1.123 ± 0.13 μg/mL for Ala91Val, Asp95Ala, Asp95Gly, and Asp95Tyr, respectively. For DC159a, the IC_{50} values were 0.229 ± 0.03 μg/mL for WT and 0.831 ± 0.4, 0.539 ± 0.08, 0.870 ± 0.03, and 0.887 ± 0.09 μg/mL for the respective mutants.
All mutants showed higher IC_{50} values than the WT (4.52-8.51-fold for sitafloxacin and 2.35-3.87-fold for DC159a), indicating that DC159a retains greater inhibitory activity against mutated gyrase A.
The minimum inhibitory concentrations of sitafloxacin and DC159a were observed to be half that of moxifloxacin for the WT. DC159a showed the lowest MIC values in mutant strains compared to moxifloxacin (8-64-fold).



Conclusions: The results indicate that DC159a and sitafloxacin have a strong inhibitory profile against *M. avium* DNA gyrase A, suggesting that they may be used as a promising treatment.

LB01-1303-18 Finding TB post-treatment in India: Cost-effectiveness of phone compared to home-based screening

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Background: Despite successful tuberculosis (TB) treatment, survivors and their household members remain at elevated risk for TB. Active case finding (ACF) targeting the index and associated household members can address the importance of case finding gaps; however, evidence on resource implications and cost-effectiveness of different ACF approaches for these risk groups remains limited.
Design/Methods: As part of the TB Aftermath - a hybrid effectiveness-implementation trial comparing home versus phone-based screening among TB survivors and their HHCs in Pune, India , we conducted cost and cost-effectiveness analysis from the health service provider perspective. Total costs per arm and average cost per household visit were estimated and proportioned according to the time taken to conduct the activities. The Incremental Cost-Effectiveness Ratio (ICER) was defined as the incremental cost per additional TB case detected through home-based screening relative to phone screening. Costs were calculated for an initial design phase of 8 months and a 40-month implementation period.All costs were assessed from the health service provider perspective and annuitized over 5 years at a 3% discount rate.
Results: The total programmatic cost was $4941.96 for the home-based arm and $661.10 for the phone arm, reaching the households of 537 and 539 index participants enrolled in the respective arms of the trial.When accounting for all households assessed, the total cumulative cost was $9.16 and $1.23 per household in the home and phone-based ACF strategy. With a total of 58 and 37 people with TB detected in the home-phone-based strategies, the cost per TB case detected was $85.20 and $17.39 for the respective strategies. The incremental cost-effectiveness ratio (ICER) was $203.85 per additional TB case detected.

Study Arm	Total no of household enrolled	Cumulative cost per household	Total cost	Incremental cost	Total no of TB cases detected	Incremental TB case detected	Cost per TB case detected	ICER
Home Based Arm	539	$9.16	$4941.96		58		$85.20	
				$4280.86		21		$203.85
Phone Based Arm	537	$1.23	$661.10		37		$17.39	

Conclusions: Despite higher resource needs, home-based ACF approach for post-TB case finding was able to detect more people with TB amongst the index participants' households, allowing for earlier case detection.

LB01-1304-18 Diagnostic and predictive accuracy of a 3-gene *M. tuberculosis* Host Response Cartridge in household contacts – Updated results from the multi-centre prospective ERASE-TB study

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Background: WHO recommends TB screening for household contacts (HHCs). Non-sputum diagnostics based on mRNA expression show promise.
Design/Methods: We evaluated the diagnostic and predictive accuracy of the Cepheid Xpert *Mycobacterium tuberculosis* Host Response (MTB-HR) prototype for TB in the context of HHC screening. 2,079 HHCs (≥10 years) from Mozambique, Tanzania, and Zimbabwe were included. TB screening (clinical, radiological, microbiological) was conducted every 6 months over 24 months. We analysed MTB-HR scores and area under the receiver operating curves (AUROC) stratified by symptom and HIV status. Optimal MTB-HR score thresholds were identified using the Youden method. Sensitivity, specificity, and positive/negative predictive values were calculated with 95% confidence intervals (95%CI) using the Wilson method.
Results: The median MTB-HR score was -0.9 (IQR -1.3 – -0.60) in HHCs without TB and -2.6 (IQR -3.1 – -1.7) in HHCs with TB. Symptomatic HHCs with TB had low-

er MTB-HR scores than asymptomatic HHCs: -2.6 (IQR -3.1 – -1.9) vs. -1.2 (IQR -1.7 – -0.84, p=0.006). Analysis of diagnostic accuracy included 41 HHCs with MTB-HR results within 30 days of TB diagnosis. AUROC was 0.86 (95%CI 0.79–0.92). At a cut-off of -1.475, sensitivity was 81% (95%CI 66–90) and specificity 81% (95%CI 79–83). Sensitivity was higher in HIV-negative and symptomatic HHCs, while specificity was higher in HIV-positive and asymptomatic HHCs. Negative predictive value exceeded 98% across subgroups; positive predictive value was low.
Prediction analysis included 21 and 14 people with incident TB at 6 and 12 months, respectively. AUROC was 0.77 (95%CI 0.65–0.89) at 6 months, and 0.56 (95%CI 0.41–0.71) at 12 months. At 6 months, a -1.675 cut-off yielded 62% sensitivity (95%CI 41–79) and 87% specificity (95%CI 86–89).

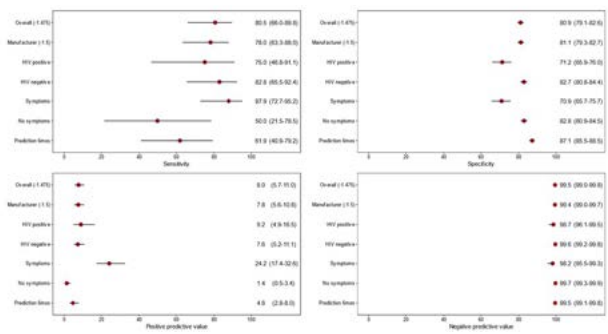

Figure. Accuracy of the MTB-HR assay for TB diagnosis and prediction: sensitivity (a); specificity (b); positive (c) and negative predictive values (d).

Conclusions: Our results indicate that the MTB-HR might be useful in identifying HHCs who need further testing or closer follow-up for the detection and management of TB.

LB01-1305-18 Impact of sequencing and analysis artefacts on the performance of the WHO mutation catalogue for genotypic drug susceptibility testing of *M. tuberculosis*

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Background: The WHO *Mycobacterium tuberculosis* complex mutation catalogue has become the reference standard for interpreting genotypic drug susceptibility (DST) results. To boost the sensitivity of the catalogue, it includes a set of additional grading rules to classify novel or rare mutations with limited phenotypic and genotypic DST data as markers of resistance. If triggered incorrectly, however, these rules may overcall resistance.
Design/Methods: We investigated the root-causes of unexpectedly high levels of genotypic resistance to rifampicin and pretomanid/delamanid.
Results: During an external quality control assessment, two of the fifteen participating laboratories reported a low-frequency *rpoB* variant (~5% at position 1346 in codon 449) that triggered the additional grading rule for rifampicin. Phenotypic DST, additional data analyses, and use of alternative sequencing reagents suggested these variants were sequencing artefacts.
The end of *fbiC* overlaps 2.7 repeats in the *M. tuberculosis* H37Rv reference genome. The deletion of one or more of these repeats inappropriately triggered the loss-of-function additional grading rule, resulting in the false prediction of delamanid and pretomanid cross-resistance, even though the end of *fbiC* remained unchanged. In the Dutch reference laboratory database, this phenomenon was observed in >30% of 7400 isolates in a lineage-dependent manner.
Conclusions: The additional grading rules inferring drug resistance were erroneously triggered because of sequencing and analysis artefacts. Our findings underline the importance of quality control of both laboratory and computer-assisted data analysis procedures, as well as the rapid communication of exceptions and adjustments to the WHO catalogue rules. Indeed, the second edition of the mutation catalogue already acknowledged the *rpoB* exception and the third edition is due to include the *fbiC*

exception. The latter issue has already been addressed in v6.3.0 of TB Profiler, an open source tool for genotypic DST using the second edition of the WHO mutation catalogue.

LB01-1306-18 Estimating the global financial burden of TB: Updated forecasts and funding scenarios, including a PEPFAR withdrawal scenario analysis

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Background: Tuberculosis (TB) remains a leading infectious killer, with 10.8M cases and 1.3M deaths in 2023, imposing a $81.5B financial burden. Stagnant incidence and a $16.3B funding gap (vs. $22B need) undermine WHO's End TB targets. This analysis updates TB's financial burden and models a 50% PEPFAR cut's impact on 2025 TB outcomes and financial burden.
Design/Methods: We developed a financial model using WHO TB incidence and mortality data (2015-2023), Global Fund financing reports, and TB patient cost surveys. Forecasts for 2024-2025 were produced using ARIMA time series models. Economic burden components included health system costs, household expenditures, and productivity losses (valued at US$50,000 per TB death). Three funding scenarios for 2025 were modeled:
- **Status Quo** (US$6B/year),
- **Increased Global Fund allocation** (US$8B/year),
- **PEPFAR Withdrawal** (-US$1B donor funding).

Sensitivity analysis varied household costs (US$500 -1,500) and mortality loss (US$25,000 - 75,000). A regression model estimated deaths averted per US$1B invested (0.415 million).
Results: In the Status Quo ($6.5B), 2025 projects 10.6M cases, 1.3M deaths, and an $84.5B burden ($6.5B health, $10.6B household, $67.5B mortality). Increased Funding ($8.0B) averts ~312,000 deaths (1.2M deaths), reducing the burden to $78.6B. The PEPFAR Cut ($7.25B) increases deaths by ~312,000 (1.512M), raising the burden to $93.45B ($7.25B health, $10.6B household, $75.6B mortality). Sensitivity analysis shows burdens of $47.6B-$108.7B across cost ranges. Each $1B in funding averts ~$8B in economic losses.
Conclusions: TB's $81.5B-$93.45B annual burden, driven by mortality, demands urgent funding. Increased investment could save 312,000 lives and $14.85B, while PEPFAR cuts risk setbacks, especially in TB/HIV regions. Sustained Global Fund and bilateral support are critical to meet 2030 End TB goals.

LB01-1307-18 Assessing the economic viability of introducing new shorter TB drug regimens in Ethiopia

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Background: The Ethiopian national TB program dedicates millions of dollars yearly for the programmatic management as well as for the procurement of life-saving medications. This research evaluates the economic viability of shorter-duration DRTB regimens through an assessment of their cost-effectiveness and potential advantage with longer and individualize treatments.
The research investigates more affordable and efficient treatment options to improve health system efficiency and effectiveness.
Design/Methods: A cross-sectional study design was used to evaluate the economic feasibility of introducing new shorter TB drug regimens in Ethiopia. The research design combined quantitative and qualitative methods to gather complete economic and healthcare data during a particular time period.
The cost benefits (CBA) analysis evaluates the economic and health outcomes of shortening TB regimens against the longer TB regimen and Indvidualized Longer TB regimens. The cost data includes both medical expenses for drugs and diagnostic tests and doctor visits and patient travel expenses that are not medical in nature.
A thorough literature review combined with data collection from all hospitals and randomly selected facilities used to compile comprehensive expenditures.
Results: A total of 271 DR-TB patients from 13 regions of Ethiopia were included in this study, F (3, 271) =10.695, p= 0.000001, η^2 = 0.107 (large effect size), The ILTR group had significantly higher OOP than the LTR (Mean diff=24.213, p=0.000079, 95% CI [10.1, 38.33], and the OOP of LTR had significant difference with the STR (Mean diff=-28.471, p=0.000002, 95% CI [-42.47, -14.47].
The Cost-Utility Analysis (CUA) result indicates, Short-Term Regimen (STR) provided the lowest cost per QALY at $1296.72 followed by the Long-Term Regimen (LTR) at $2301.71 and the Individualized Long-Term Regimen (ILTR) at $4750.1 per QALY gained.
Conclusions: A shorter regimen offers the ability to decrease financial costs through reduced direct treatment expenses and decreased healthcare facility congestion and better patient compliance.

LB01-1308-18 TB and cytomegalovirus co-pathogenicity amongst adults with cryptococcal meningitis: A prospective cohort study

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Background: Case fatality amongst adults with HIV-associated cryptococcal meningitis is 24-45% at 10-weeks. Co-prevalent tuberculosis (TB), cytomegalovirus (CMV) and bloodstream infections (BSI) may contribute to poor outcomes.
Design/Methods: We prospectively enrolled adults with cryptococcal meningitis from three tertiary referral hospitals in Uganda. Participants underwent enhanced screening for TB disease (urine TB-LAM and Xpert MTB/Rif Ultra testing, Myco/F blood cultures, chest radiography), CMV viremia (quantitative polymerase chain reaction), and bacteremia (blood cultures at baseline and day-7). Prevalence of co-infections and associations with mortality were determined; adjusted for age, sex, site, CD4 and anti-retroviral therapy.

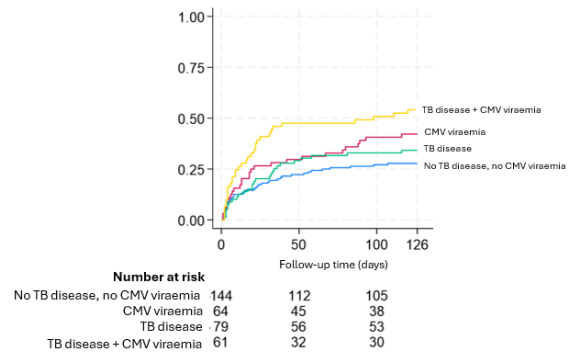

Figure 1. Cumulative all-cause mortality over time amongst Ugandan adults diagnosed with HIV-associated cryptococcal meningitis, stratified by CMV and TB disease co-infection sub-group.

Results: We enrolled 450 adults, median age 36 (IQR 30-42) years, median CD4 count 29 (IQR 11-75) cells/mm^3. Overall, 45% (204/450) had TB disease diagnosed: 18% (79/450) were receiving anti-tuberculous therapy at enrolment, and 28% (125/450) were diagnosed with TB during hospitalization (n=74 with microbiologically-confirmed TB); 34% (144/417) had CMV viremia and 3% (12/422) had a significant bacterial BSI.
Participants with TB disease had higher 18-week mortality vs. participants without TB disease (44% vs. 33%; adjusted Odds Ratio (aOR) 1.70; 95%CI, 1.09-2.63).
Participants with CMV viremia had two-fold higher mortality at both 2-weeks (21% vs. 11%, aOR 2.19; 95%CI 1.24-3.86), and 18-weeks (48% vs. 30%; aOR 2.20; 95%CI, 1.37-3.53) vs. participants without CMV viremia. Bacteremia was not associated with mortality. Amongst participants with CMV viremia, TB and cryptococcosis, 18-week mortality was 54% (33/61) vs. 28% (40/144) among participants with cryptococcosis alone (aOR 3.30; 95%CI 1.74-6.27).
Conclusions: Co-infections amongst adults with cryptococcosis are highly prevalent; TB and/or CMV viremia occurred in >50% of participants. 18-week mortality was highest amongst participants with both TB disease and CMV viremia indicating co-pathogenicity in the context of HIV-associated cryptococcal meningitis. Empirical TB treatment and/or targeted anti-CMV therapy may be a potential therapeutic intervention to improve overall survival outcomes amongst this high-risk population.

LB01-1309-18 Pre-existing isoniazid resistance selects for acquired rifampicin-resistant TB: A combined prospective cohort and case-control study in Ho Chi Minh City, Viet Nam

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Background: Isoniazid resistance is present in ~20% of tuberculosis (TB) cases in Vietnam. The national TB programme (NTP) uses Xpert (Ultra) MTB/RIF for routine diagnostics, however, these platforms do not detect pre-existing isoniazid resistance.
Design/Methods: We conducted two complementary studies in Ho Chi Minh City between March 2020 and April 2024. First, we prospectively enrolled all adults routinely diagnosed with rifampicin-resistant (RR) TB by Xpert, cultured and sequenced their sputum samples, and analysed whole-genome sequencing data alongside publicly available genomes. We combined clinical history and phylogenetic criteria to define whether resistance was likely transmitted or acquired, estimating the contribu-

tion of each to overall RR-TB burden. Second, among adults with initially rifampicin-susceptible (RS) TB who developed recurrence, we compared controls, who remained RS at recurrence, to cases, who developed RR-TB. Paired isolates from initial and recurrent episodes underwent WGS to exclude reinfection and identify bacterial predictors of RR acquisition.

Results: In the prospective cohort, we enrolled, sequenced and confirmed RR-TB in 1,369/2,336 cases (59%) reported to the NTP. Overall, 82% (80.3–84.3) of RR-TB was attributed to transmission and 15% (13.5–17.3) to acquisition. Paired WGS data were available for 174/525 controls and 138/211 cases. Of these, 13 controls (7%) and 8 cases (6%) were excluded after identifying non-tuberculous mycobacteria as the major species during their initial episode. New infections were responsible for 29% (n=46) and 40% (n=52) of recurrences for controls and cases, respectively. Among 115 controls and 78 cases with confirmed relapse or treatment failure, pre-existing isoniazid resistance was the strongest predictor of RR acquisition (OR 100,19-1882).

Conclusions: Acquired resistance comprises ~15% of the RR-TB burden in Ho Chi Minh City and almost invariably follows pre-existing isoniazid resistance. These findings supporting expanding routine diagnostics to include rapid detection of isoniazid resistance, enabling timely treatment modification which may prevent acquired RR-TB.

LB01-1310-18 Causal links between gut microbiota and the risk of TB and type 2 diabetes: A Mendelian randomisation meta-analysis

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Background: The global syndemic of tuberculosis (TB) and type 2 diabetes mellitus (T2DM) is increasingly recognized as being shaped by shared immunometabolic dysfunctions. The gut microbiota, a central regulator of immune and metabolic pathways, is implicated in both diseases, yet the causal underpinnings remain unresolved. Mendelian Randomization (MR) enables evaluation of microbiota-disease associations while minimizing confounding and reverse causation.

Design/Methods: We systematically reviewed and meta-analyzed MR studies published between January, 2000 - April 2025 that investigated genetically predicted gut microbial taxa in relation to TB and T2DM risk. Databases searched included Medline, Embase, Scopus, Web of Science, and Cochrane Central. Study quality was assessed using the STROBE-MR checklist. Summary odds ratios were calculated using random-effects models where appropriate.

Results:

Fourteen MR studies (n > 5 million individuals) were included, with outcome data predominantly from European ancestry cohorts. Several microbial taxa demonstrated consistent causal associations. *Dorea*, *Alistipes*, and members of the *Lachnospiraceae* family were linked to increased susceptibility to both TB and T2DM, likely via pro-inflammatory and metabolic endotoxemic pathways. In contrast, *Ruminococcaceae UCG003* and *UCG010* exhibited protective effects in T2DM but not TB. *Akkermansia muciniphila* showed a paradoxical role, protective against T2DM by enhancing gut barrier integrity, but associated with increased TB risk, potentially via mucin degradation and immune overstimulation. *Bacteroides* was consistently associated with heightened risk for both conditions, particularly extrapulmonary TB and metabolic dysregulation.

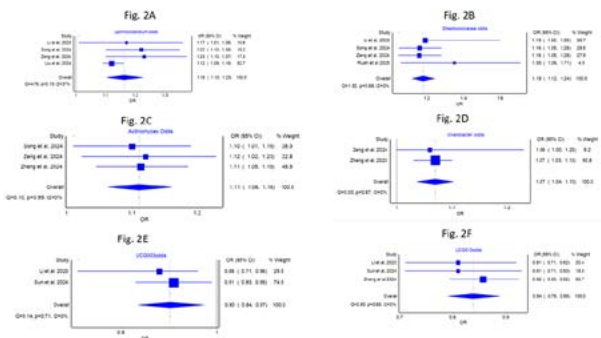

Figure: Association of Gut microbiota and T2DM.

Conclusions: Our findings support a causal role of gut microbial composition in modulating susceptibility to TB and T2DM. Several taxa exhibit disease-specific or dual associations, revealing convergent pathways along the gut–lung–metabolic axis. These insights underscore the potential for microbiota-targeted diagnostics and therapeutics, particularly in TB-DM comorbidity. Future research should prioritize species-level resolution, multi-ancestry analyses, and longitudinal studies in TBDM populations.

LB01-1311-18 Linezolid-associated adverse events and outcomes in the treatment of multidrug/rifampicin-resistant TB: A systematic review and meta-analysis of randomised controlled trials

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Background: Linezolid is widely used for multidrug/rifampicin-resistant tuberculosis (MDR/RR-TB) treatment, but its optimal dosing and treatment duration remain uncertain, particularly concerning safety and efficacy profiles. This study was conducted to systematically evaluate the safety and efficacy of linezolid-containing regimens for adults and children with MDR/RR-TB focusing on the effects of dose and treatment duration.

Design/Methods: A comprehensive literature search was performed in PubMed, Embase, Scopus, Web of Science, Cochrane Library, CINAHL, and ClinicalTrials.gov for randomized controlled trials (RCTs) published between January 1, 2001 and July 20, 2025. Eligible RCTs assessed adverse events, treatment discontinuation, sputum culture conversion, and unfavorable outcomes in individuals receiving linezolid-containing regimens versus standard of care (SOC). Pooled risk differences (RDs) were calculated using random-effects models, with subgroup analyses by dose (≤600 mg/day vs 1200 mg/day) and treatment duration (≤6 months vs 9 months and >9 months). The combined results were examined for heterogeneity, sensitivity, and publication bias.

Results: Twelve RCTs (n=3,581) were included. Linezolid did not significantly increase the risk of anemia, thrombocytopenia, leukopenia, neutropenia, optic neuritis, or gastrointestinal, renal, and hepatic disorders. However, the risk of peripheral neuropathy (RD 0.04; 95% CI 0.00-0.08; P=0.03; I^2 79%) was higher compared to SOC. Lower daily dose (≤600 mg/day) and shorter durations (≤9 months) of linezolid were associated with improved safety. Unfavorable outcomes were reduced (RD −0.15; 95% CI −0.21 to −0.09; P<0.00001) and sputum culture conversion were increased (RD 0.05; 95% CI 0.00-0.09; P=0.04) in the linezolid groups. While, treatment discontinuation did not differ significantly between the two groups.

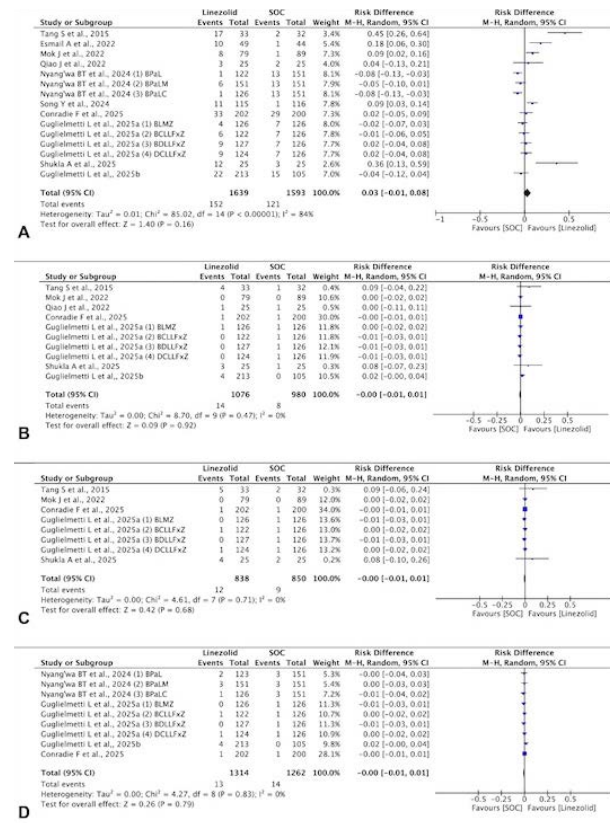

Figure: Forest plot of reported myelosuppression (A) anemia (B) thrombocytopenia (C) leukopenia (D) neutropenia.

Conclusions: Linezolid-containing regimens demonstrated acceptable safety and efficacy for the treatment of MDR/RR-TB. Lower doses and shorter durations improved tolerability without compromising treatment outcomes. These findings support current WHO-recommended regimens and highlight the potential of linezolid as a key component of shorter, effective MDR/RR-TB treatment strategies.

LB01-1312-18 Impact beyond the lungs: Evidence of muscle power deficits and functional impairment in severe pulmonary TB

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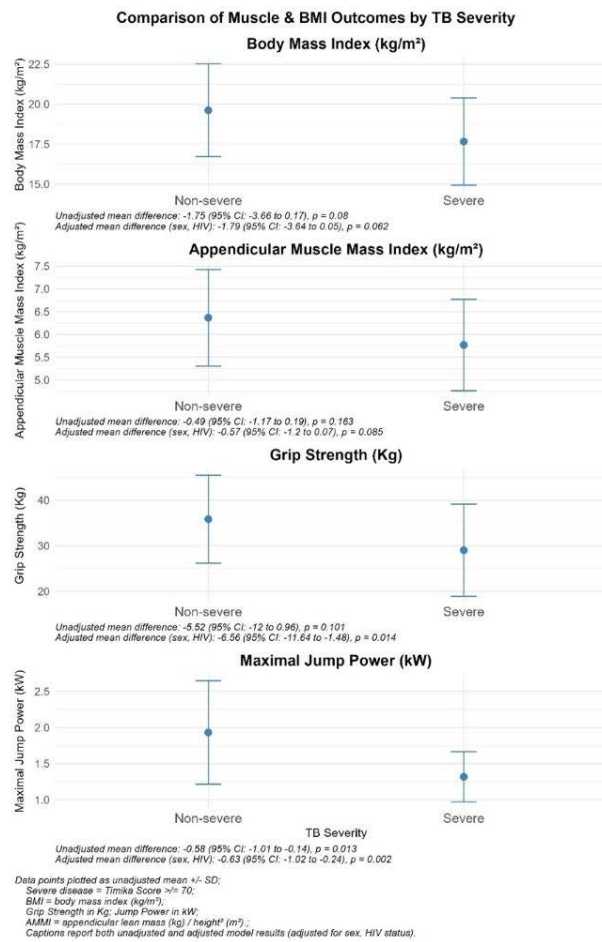
Background: Pulmonary tuberculosis is associated with cachexia but associations with muscle power and functional impairments are poorly defined. We aimed to assess the relationship between tuberculosis disease severity, muscle measurements and functional impairment.

Design/Methods: Seventy-five adults with Xpert-confirmed pulmonary tuberculosis in Harare, Zimbabwe, completed work and disability questionnaires (WHO-DAS), anthropometry, Jamar dynamometry (hand-grip strength), jumping mechanography (peak muscle power) and Short Physical Performance Battery (lower-limb strength and balance assessment; SPPB). Severe tuberculosis disease was defined as chest radiograph Timika score≥70 (range 0-140).

Appendicular Muscle Mass Index (AMMI, kg/m^2) was computed from Dual-energy X-ray Absorptiometry (DXA). Measures of functional impairment were by WHODAS>35, SPPB<12, or >50% workdays missed. Univariable and multivariable linear and logistic regression examined associations between disease severity and (a) muscle indices or (b) functional measures and adjusted for age and HIV status.

Results: All participants completed all assessments, except for jumping mechanography which 19/75 (25.0%) felt too unwell to perform. Overall, 22 (29.3%) were categorised as having severe tuberculosis. Mean age was 37.9 years (SD 8.5); 22 (29.3%) were female, 33 (44%) were underweight (BMI<18.5kg/m2) and 36 (48.0%) were living with HIV. 49 (65.3%) had a SPPB<12, indicating objective functional impairment. Participants with severe tuberculosis had lower muscle strength (mean difference -6.56kg, CI -11.64kg to -1.48kg) and power (mean difference -0.63kW, CI -1.02kW to -0.24kW) (Figure 1).

BMI and muscle mass were lower, but not significantly. Those with severe tuberculosis also had greater odds of impairment in two domains: SPPB<12 (OR 4.93 [95%CI 1.23–33.16]) and WHODAS>35 (OR 49.0 [1.25–15.65]) but were not significantly more likely to have missed >50% workdays (OR 1.64 [0.38–7.59]).



Conclusions: Severe pulmonary tuberculosis is associated with reduced muscle mass and function, potentially resulting in functional impairment through mechanisms other than lung pathology. Persistence of these findings post-treatment remains to be determined.

LB02 The Union/CDC Late-Breaker Session - Clinical Trial Advances in TB: HIV Co-Infection, Pediatric Meningitis, and New Drugs

LB02-1313-19 Safety of rifapentine-based TB prevention in pregnant women with HIV on dolutegravir: DOLPHIN-Moms trial

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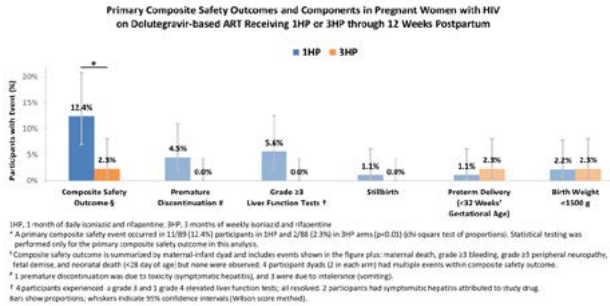
Background: WHO endorses 3-month weekly isoniazid-rifapentine (3HP) for TB prevention for people with HIV (PWH) in general. For pregnant PWH, 6-month daily isoniazid is recommended due to limited safety data of rifapentine in pregnancy. DOLPHIN-Moms is an open-label phase II trial in South Africa evaluating safety of 3HP and 1-month daily isoniazid-rifapentine (1HP) in pregnant PWH on dolutegravir-based antiretroviral therapy (DTG-ART).
Design/Methods: Pregnant PWH with HIV viral suppression at 20-34 weeks gestation were randomized to 1HP or 3HP with twice-daily DTG. Primary outcome was a composite of maternal mortality, premature discontinuation (intolerance or toxicity), targeted maternal, pregnancy, and neonatal adverse events (AEs) by 12 weeks postpartum (12wkPP).
Results: Among 177 randomized participants (n_{1HP}=89; n_{3HP}=88), median (interquartile range) age was 32 years (27-36), gestational age 26 weeks (23-30), and CD4 689 cells/mm^3 (529-828). A primary composite safety event was experienced by 11/89 (12.4%) participants in 1HP and 2/88 (2.3%) in 3HP arms (p<0.01) *(Figure)*.
All maternal grade ≥3 liver enzyme elevations occurred in the 1HP arm (5/89 [5.6%]); all resolved. Grade ≥3 AEs occurred in 24/89 (27.0%) maternal participants in 1HP and 15/88 (17.0%) in 3HP arms. Treatment completion was similar for both arms (1HP: 83/89 [93%]; 3HP: 87/88 [99%]). One infant death (non-treatment related due to bacterial pneumonia) occurred in the 1HP arm. No maternal deaths, infant HIV infection, or maternal or infant TB disease occurred. 95% of participants with viral load data through 12wkPP remained consistently virally suppressed (1HP: 85/88 [97%]; 3HP: 79/87 [91%]). All but 1/11 participants with detectable viral load at any time before 12wkPP had subsequent viral suppression.



Conclusions: Among pregnant PWH on twice daily DTG-ART, those receiving 3HP had fewer adverse composite safety events than 1HP. High rates of treatment completion and viral suppression were observed with both regimens, supporting expanded TB prevention options in pregnancy.

LB02-1314-19 Six-month mortality in ATLAS trial of immediate and/or high-dose anti-TB therapy for adults with HIV-related sepsis

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Background: The greatest burden of sepsis is found in persons living with HIV (PLWH) in Africa, where the risk of death is greatest from tuberculosis (TB) compared to other non-TB pathogens. The ATLAS trial recently found immediate conventional-dose anti-TB therapy improved 28-day mortality for PLWH admitted with sepsis and later found to have TB (11.8% versus 38.4% for diagnosis-dependent treatment, standard-of-care).
Design/Methods: We now report on the 6-month outcomes of the phase 3, multisite, open-label, randomised controlled 2×2 factorial superiority trial of (1) immediate and (2) high-dose anti-TB therapy in addition to stan-

dard of care (ceftriaxone for seven days) for adult PLWH admitted with sepsis at four hospitals in Tanzania and Uganda. The intervention was continued for 28 days, after which a non-study clinician determined the need for continuation of anti-TB therapy.

Results: Among 395 participants, we assigned 99 to immediate conventional-dose, 99 to immediate high-dose, 100 to diagnosis-dependent high-dose, and 97 to diagnosis-dependent conventional-dose (standard-of-care) therapy. We confirmed TB in 204 (51.6%) participants. The 6-month mortality was 38.9% for the immediate conventional-dose group, 44.4% for the immediate high-dose group, 35.5% for the diagnosis-dependent high-dose group, and 41.8% for the diagnosis-dependent conventional-dose group (not statistically significant). In participants with later confirmed TB, the adjusted hazard ratio (95%CI) for 6-month mortality relative to the standard of care was 0.47 (95%CI, 0.24-0.90; p=0.02) for the immediate conventional-dose group; 0.61 (95%CI, 0.32-1.13; p=0.12) for the immediate high-dose group; and 0.56 (95%CI, 0.31-1.01; p=0.06) for the diagnosis-dependent high-dose group. No significant differences in adverse events occurred among treatment groups.

Conclusions: Immediate conventional-dose anti-TB therapy significantly reduced 6-month mortality in those later confirmed to have TB, comprising the majority of the population. Further studies should consider the optimal timing of anti-TB discontinuation in those that survive sepsis without later diagnostic confirmation of TB.

LB02-1315-19 In pursuit of an improved oxazolidinone for TB: A phase 1 trial evaluating safety, tolerability, pharmacokinetics, and food effect of TBD09 (MK-7762) in healthy adults

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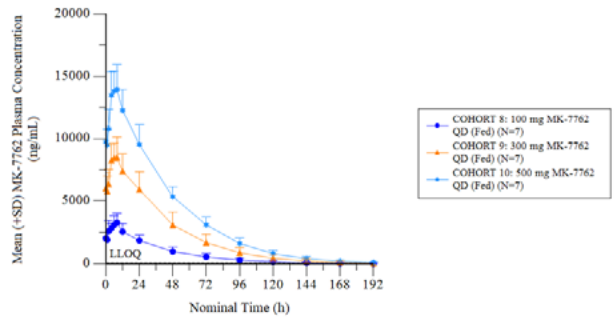
Background: The drug candidate TBD09 (previously MK-7762) is a novel oxazolidinone with similar or better potency than linezolid in pre-clinical tuberculosis (TB) models and a potentially improved safety profile with less off-target mitochondrial protein synthesis inhibition. A first-in-human trial characterized the safety and pharmacokinetics (PK) of TBD09 in healthy adults.

Design/Methods: Gates MRI-TBD09-101 was a randomized, double-blind, placebo-controlled clinical trial. Part 1 included 5 cohorts evaluating single ascending doses (SAD) of oral TBD09 (50, 150, 300, 600, or 1200 mg) or placebo in fasted participants, and a cross-over food effect (FE) cohort with TBD09 (300 mg) in fasted and fed (high-fat, high-calorie) states.

Part 2 included a 3-period FE cohort (600 mg: fasted; standard meal; high-fat, high-calorie meal) and 3 multiple ascending dose (MAD) cohorts (100, 300, 500 mg, or placebo) in fasted or fed states (28 days).

Results: Forty-eight participants (n=40, SAD Cohorts 1-5; n=8, FE Cohort 6) were dosed in Part 1 and 71 participants (n=11, FE Cohort 7; n=60, MAD Cohorts 8-10) were dosed in Part 2. TBD09 was well-tolerated with no safety concern identified at exposures that exceeded the PK target. TBD09 did not impact hematologic safety lab values over 28 days in MAD cohort participants. The observed half-life of TBD09 in plasma (geometric mean) on Day 28 in the MAD cohorts ranged between 24.0 - 26.3 hours (Figure).

TBD09 C_{max} and AUC increases were dose-proportional after single doses through 300 mg, and less than dose-proportional above 300 mg. In Cohort 7, TBD09 AUC_{0-24} and C_{max} increased by approximately 1.4 to 1.6-fold in the fed state, compared to fasted, following a 600 mg dose.



Conclusions: The results of Gates MRI-TBD09-101 support continued development of TBD09. Additional clinical trials with longer dosing durations and in participants with TB are planned to further characterize the safety and efficacy of TBD09.

LB02-1316-19 Shortened intensive anti-TB treatment and aspirin for African and Asian children with TB meningitis: The 48-week results from the phase-3 factorial randomised SURE trial

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Background: Tuberculous meningitis (TBM) has high mortality (~20%) and neurological sequelae (~50%), particularly in young children. Standard WHO-recommended 12-month standard-of-care anti-tuberculosis treatment (SOC-ATT) (2m HRZE;10m HR) for TBM follows pulmonary TB treatment, but CNS penetration is suboptimal. Inflammation plays a major role in TBM, but data on aspirin in children are sparse.
Design/Methods: We randomised children with TBM to 24-week intensive ATT [isoniazid (20mg/kg), rifampicin (30mg/kg), pyrazinamide (40mg/kg), levofloxacin (20mg/kg)] versus SOC-ATT (10% non-inferiority margin), and factorially, to aspirin (20mg/kg) versus placebo as adjuvant anti-inflammatory therapy (superiority); all children received corticosteroids (standard care). The primary 48-week efficacy endpoints were mortality and modified Rankin Scale (mRS) respectively.
Results: 369 children were enrolled from 9 hospitals (4 Vietnam, 2 India, 1 Zambia, 1 Zimbabwe, 1 Uganda) between 03/2021-07/2024. Median age was 4.8 years (2m-18y), 53% male, 4% living with HIV, 77% definite/probable TBM (Marais criteria); TBM stage I/II/III were 46%/40%/14%. 48-week vital status was ascertained for 99% and mRS for 95% of the modified-intent-to-treat population (excluding 6 with alternative diagnoses).
Preliminary results showed non-inferiority of intensive-ATT was **NOT** demonstrated: 29(16%) intensive-ATT versus 21(12%) SOC-ATT died: adjusted risk difference=5.1% (95%CI -1.7% to +12.0%; p=0.14). There was a trend towards an interaction (p=0.13), with numerically higher mortality risk in each of the SOC-ATT-aspirin (adjusted hazard ratio(aHR) vs SOC-ATT-placebo=2.81 (1.09-7.28) p=0.03), intensive-ATT-placebo vs SOC-ATT-placebo (aHR=2.52 (0.97-6.59) p=0.06), and intensive-ATT-aspirin vs SOC-ATT-placebo (aHR=2.85 (1.10-7.38) p=0.03) (unadjusted for multiple testing). 38/176(22%) aspirin versus 25/170(15%) placebo had mRS scores 5/6 (severe disability/died) (adjusted odds ratio=1.80, (95%CI 0.95-3.41; p=0.07). 100/186(54%) intensive-ATT versus 79/183(43%) SOC-ATT experienced ≥1 grade 3/4 adverse events (p=0.04), and 103/185(56%) vs 76/184(41%) on aspirin versus placebo respectively (p=0.006). Among week-48 survivors, 238/296(80%) had no symptoms/disability (mRS=0/1), 76% with aspirin versus 85% with placebo (adjusted p=0.02).

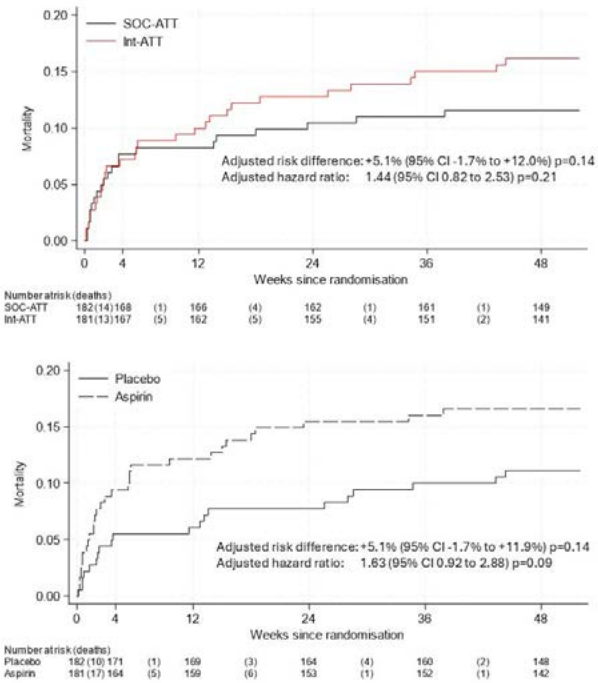

Figure: Mortality through 48 weeks by (A) Intensive-ATT vs SOC-ATT and (B) aspirin vs placebo.

Conclusions: Neither shortened intensive-ATT nor aspirin showed any benefit for children with TBM. Post-treatment follow-up to week-72 is ongoing.

LB02-1317-19 DA-7801: Cost-effective anti-TB drug with strong efficacy and low toxicity

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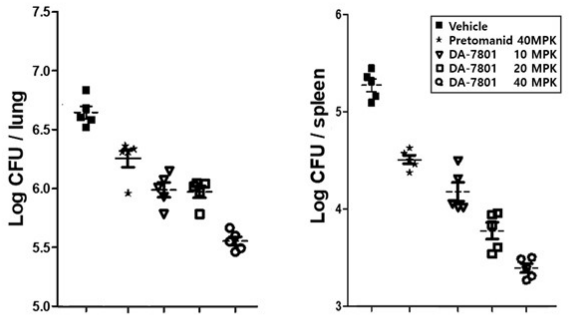
Background: Global tuberculosis (TB) treatment heavily relies on international aid, yet less than half of the $13 billion required annually is secured. To improve treatment access in low-income countries, there is an urgent need for new TB drugs with high efficacy and drastically reduced production costs.
Design/Methods: DA-7801, developed by Dong-A ST, represents a novel anti-TB agent engineered through AI-based molecular modeling to optimize drug properties, including simple chemical synthesis and scalable, cost-efficient mass production. The compound's antimicrobial efficacy was rigorously evaluated in vivo using well-established murine TB infection models to simulate human disease.
Safety assessments were conducted through repeated-dose toxicity studies in rats, with particular attention to the no-observed-adverse-effect level (NOAEL) to define therapeutic windows and safety margins.
Results: DA-7801 exhibited potent in vitro antibacterial activity against *Mycobacterium tuberculosis*, with a minimum inhibitory concentration (MIC) of ≤0.016 μg/mL,

indicating strong potency. In vivo efficacy studies demonstrated significant reduction of bacterial loads in lung tissue, outperforming existing reference drugs by over fourfold. Toxicity studies revealed an excellent safety profile, with a NOAEL exceeding 300 mg/kg in rats, approximately one-third of the toxicity observed with current TB therapies. These data collectively highlight DA-7801's promising therapeutic potential and favorable safety margins.



	Vehicle	Pretomanid (40)	DA-7801 (10)	DA-7801 (20)	DA-7801 (40)
Avg.	6.64	6.18	5.95	5.94	5.54
Decrease		-0.46	-0.69	-0.70	-1.10

	Vehicle	Pretomanid (40)	DA-7801 (10)	DA-7801 (20)	DA-7801 (40)
Avg.	5.26	4.49	4.21	3.80	3.41
Decrease		-0.77	-1.06	-1.46	-1.86

In Vivo Efficacy Evaluation.

Conclusions: DA-7801 meets key preclinical requirements for anti-TB drug development and is poised to enter clinical trials. It has demonstrated broad-spectrum activity from drug-susceptible (DS) to multidrug-resistant (MDR) TB. A combination regimen with bedaquiline is also under investigation to shorten MDR treatment duration. With its simple synthesis and low-cost scalability, DA-7801 holds promise for enhancing global TB treatment accessibility.

LB02-1318-19 IMPAACT 2034: Phase 1 study of the pharmacokinetics (PK), safety/tolerability and acceptability of a single dose of pretomanid in female children with rifampicin-resistant TB

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Background: Pretomanid is approved in adults for the treatment of tuberculosis (TB) resistant to isoniazid, rifamycins, a fluoroquinolone and a second-line injectable antibacterial drug. Ten and 50mg dispersible tablet formulations were developed for pediatric use and shown in healthy adults to achieve exposures similar to the adult marketed formulation. IMPAACT 2034 investigated the pharmacokinetics, safety/tolerability, and acceptability of a single dose of pretomanid in female children with rifampicin-resistant TB (RR-TB).

Design/Methods: 28 female children with RR-TB, 6 with HIV, on an optimized background TB regimen (OBR), were enrolled in South Africa (N=26) and Thailand (N=2) into 4 weight cohorts: 1 (≥31 kg, N=8); 2 (20-<31 kg, N=2); 3 (12-<20 kg, N=8); 4 (4-<12 kg, N=9). All received a single dose of pretomanid based on weight, ranging between 20 and 200mg, using the marketed tablet or the scored, pediatric formulations. The primary objective was to confirm modeled weight-based doses of pretomanid for future evaluation in a multiple-dose (MD) study. Participants were followed up for 2 weeks post-dosing. We conducted an interim PK analysis in 27 PK-evaluable participants. A previously developed population PK model based on data from 3 pretomanid studies in adults with TB was used as starting point.

Results: Median age was 5 years (range 0.6-17.6 years), median weight 15.1 kg (range 6.9-56.8 kg). The PK of pretomanid was characterized with sufficient precision and power across cohorts to predict doses in the MD study for all cohorts. Study doses achieved exposures (C_{max} and AUC) that were comparable to those in healthy and TB-infected adults. The overall safety for a single dose of pretomanid was acceptable across ages and weight cohorts.

PK Parameter	Statistics	All (N=27)	Cohort 1 (N=8)	Cohort 2 (N=2)	Cohort 3 (N=8)	Cohort 4 (N=9)
Cmax (ng/mL)	Median (Range)	2275 (1341-3562)	2124 (1399-3850)	2272 (2207-2338)	2295 (2060-2520)	2243 (1354-3562)
	Mean (SD)	2260 (570)	2175 (530)	2272 (93)	2317 (570)	2285 (720)
	Geometric Mean (GSD)	2188 (1.3)	2113 (1.3)	2272 (1)		2182 (1.4)
AUC_{0-48} (hg*h/mL)	Median (Range)	51.4 (25.5-82.7)	51.5 (34.9-73.5)	50.4 (49.4-51.4)	50.6 (41.1-71.1)	52.4 (25.5-82.7)
	Mean (SD)	53.2 (14)	54.2 (14)	50.4 (1.5)	52.5 (11)	53.5 (20)
	Geometric Mean (GSD)	51.2 (1.3)	52.6 (1.3)	50.4 (1)	51.6 (1.2)	49.8 (1.5)
$AUC_{0-\infty}$ (hg*h/mL) (model)	Median (Range)	59.6 (28-95.9)	66.2 (45.9-94)	58.6 (58.1-59.1)	57.5 (46.8-85.5)	59.8 (28-95.9)
	Mean (SD)	63.5 (1.8)	68.6 (1.9)	58.6 (1.5)	60.9 (1.3)	62.4 (24)
	Geometric Mean (GSD)	60.9 (1.4)	66.3 (1.3)	58.6 (1)	59.8 (1.2)	57.9 (1.5)

SD, standard deviation; GSD, geometric SD
Cohort 1 (weight ≥31 kg); Cohort 2 (weight 20 – <31 kg); Cohort 3 (weight 12 – <12 kg) – Cohort 4 (weight <12 kg)

Table. Summary of PK Parameters for Participants in IMPAACT 2034.

Conclusions: The interim PK data provided sufficient power to select doses for a future MD study. A single dose of pretomanid was safe and tolerated in female children.

LB02-1319-19 An AI chest X-ray severity score is prognostic of time to culture conversion in a pulmonary TB clinical trial

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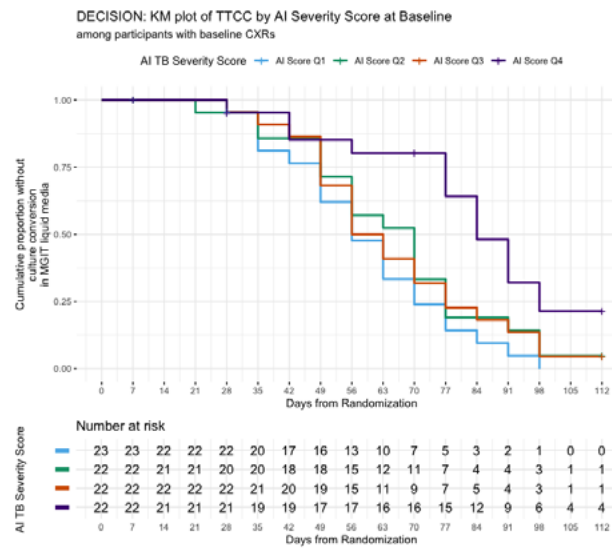
Background: Computer-aided detection (CAD) systems have demonstrated value in tuberculosis (TB) screening frameworks, but their value in describing disease severity and predicting treatment response remains unexplored. Our study evaluated the associations between a novel AI-generated chest X-ray (CXR) score, measured at baseline, and early microbiological response, measured as time to culture conversion (TTCC) in liquid media.
Design/Methods: We performed a secondary analysis of CXRs from participants enrolled in DECISION, a 16-week phase 2 dose-finding clinical trial conducted at four sites. Cox proportional hazards models were used to assess the relationship between baseline AI-generated severity score and TTCC, both unadjusted and adjusted for baseline covariates: age, sex, HIV status, and BMI. Since trial results have not been publicly presented, all analyses aggregated data across treatment arms.
Results: Of 92 enrolled individuals, 89 had baseline CXRs available. Novel severity scores were generated by quantifying size and probability of active TB from heat maps from CAD4TB v7.0, an existing CAD screening tool. The median baseline severity score was 36.3 (range 7.1-66.1). In unadjusted analyses, the severity score was strongly associated with TTCC, with a hazard ratio of 0.77 per 10 unit increase in score (CI: 0.66-0.89, $p < 0.0001$); results were similar in the adjusted analysis (HR: 0.69 CI: 0.57-0.83, $p < 0.001$). When split into quartiles, participants with the highest 25% of scores converted more slowly than the least severe group, with a median difference in TTCC of 28 days (HR 0.32, CI: 0.16-0.62, $p < 0.0001$).



Conclusions: An AI-generated CXR severity score at baseline offers a potentially powerful tool to identify patients at risk of delayed culture conversion. These findings, collected in a trial setting, highlight the tool's potential for early risk stratification in treatment of pulmonary TB, with the additional benefit of improving consistency in data collection within multi-site studies.

LB02-1320-19 Missed opportunities: High yield of universal TB testing in people and their companions in the emergency department in South Africa

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Background: Emergency departments (EDs) serve high-risk populations who may not access other healthcare, representing unique opportunities for tuberculosis (TB) screening. We performed an observational study examining sputum TB PCR testing yield among ED patients and companions in a large South African township.
Design/Methods: Adult patients and companions at the Botshabelo hospital ED in the Free State, South Africa were offered HIV and sputum TB PCR testing irrespective of TB symptoms or risk factors after individual informed consent. Sputum specimens were tested in the hospital laboratory using the BD Max MDRTB system per standard of care.
Results: Of 568 assessed individuals, 217 were ineligible (24 on TB treatment, 108 unable to consent due to illness severity or intoxication, 76 declined, 9 other). All 362 enrolled participants provided sputum. Of 308/362 with valid sputum TB PCR results: 124 (40%) were ED patients and 184 (60%) companions.
Participants were 87% male, median age 36 years (IQR 27-43), 22% living with HIV, and 18% WHO symptom screen positive. TB risk factors included smoking (58%), alcohol misuse (AUDIT-C score >= 3 for women and >= 4 for men) (56%), incarceration history (29%), mining history (8%), and close TB contact (8%).

Characteristic	Overall n = 308	Sputum TB PCR negative n = 294	Sputum TB PCR positive n = 14	p-value
Attending as patient (vs companion)	184/308 (40%)	177/294 (60%)	7/14 (50%)	0.6
Male sex	269 /308 (87%)	256/294 (87%)	13/14 (93%)	>0.9
Age (median, IQR)	36.0 (26.9, 43.2)	35.8 (27.9, 42.8)	41.6 (25.9, 51.4)	0.4
WHO symptom screen positive	55/308 (18%)	53/294 (18%)	2/14 (14%)	>0.9
Living with HIV	64/286 (22%)	60/272 (22%)	4/14 (29%)	0.5
Alcohol misuse	134/241 (56%)	127/230 (55%)	7/11 (64%)	0.8
Current smoker	179/308 (58%)	171/294 (58%)	8/14 (57%)	0.9
History of incarceration	88/308 (29%)	84/294 (29%)	4/14 (29%)	> 0.9

Table.

Overall, 14/308 (4.5%, 95% CI 2.6% - 7.7%) had a positive sputum TB PCR with no significant difference between ED patients (5.6%) and companions (3.8%, p=0.6). Among 14 individuals with TB, half were companions, 7% reported cough, 14% were WHO symptom screen positive, 70% were HIV-negative, and 60% had no identifiable TB risk factors.
Conclusions: High TB testing yield (4.5%) among unselected[TS1] ED patients and companions –most asymptomatic and without identifiable risk factors – demonstrates significant missed opportunities for TB detection in South African emergency department settings in South Africa. These findings support further exploring universal TB testing approaches in EDs within high TB prevalence settings.

LB02-1321-19 Bedaquiline long-acting formulation: Interim results of a phase 1 pharmacokinetic and safety study for single-dose TB preventive treatment

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Background: A long-acting injectable (LAI) formulation is being evaluated in healthy volunteers in this first-in-human safety/pharmacokinetics (PK) study to support dose selection of bedaquiline (BDQ) LAI for TB preventive treatment (TPT).
Design/Methods: TMC207TBC1006 is a Phase 1, open-label, parallel-group, single ascending dose study assessing the PK, safety, and tolerability of an IM injection of BDQ LAI at three doses: low-dose, 2.5mL (Group A); medium-dose, 5mL (Group B); and high-dose, 2 x 5mL (Group C). Primary endpoints include PK parameters of BDQ and M2 metabolite, adverse events (AEs) including injection site reactions (ISRs), adverse events of special interest and ECG parameters. Secondary endpoints include a pain scale and preference evaluation. PK and safety are assessed for 52 weeks after administration. This interim analysis was performed 3 months after enrolling the last participant in Group C, based on available PK and safety data from all 3 groups. A new modelling and simulation framework was developed for dose selection.

Results: 32 participants were enrolled: 4 in Group A, 8 in Group B and 20 in Group C. Interim PK analyses showed robust BDQ release, resulting in less-than-dose proportional BDQ C_{max} and AUC_{3month}. Target human BDQ exposure for TPT, as determined based on translational PK/PD, is achieved with a single BDQ LAI medium-dose, 5mL injection. Injections were generally well-tolerated. All participants experienced ISRs, which were manageable with counseling and/or minimal analgesics. ISRs were mostly pain and tenderness of grade 1 and 2 severity. Grade 3 injection-associated events include pain, tenderness and erythema in 3 participants and hypotension in 1 participant. There were no drug-related serious or grade 4 AEs.
Conclusions: Interim analyses showed robust BDQ release with no major safety concern. This first clinical study of a long-acting TB formulation informs dose selection for future investigation of BDQ LAI as potential single-dose TPT.

LB03 The Union/CDC late-breaker - TB Detection and Transmission: New Diagnostic Approaches and Study Insights

LB03-1322-21 Asymptomatic ≠ less infectious: School-based study highlights critical role of asymptomatic TB in transmission

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Background: Asymptomatic tuberculosis (TB), a crucial part of the disease spectrum, has received increasing attention. The research on its infectiousness remains insufficient. This work compared the infectiousness of asymptomatic and symptomatic TB cases in school settings.
Design/Methods: Active TB index in schools were classified into symptomatic and asymptomatic cases based on the presence or absence of cough, fever, night sweats, weight loss, or hemoptysis. Close contacts were screened using interferon-γ release assay (IGRA) in Guizhou Province, China from September 2023 to June 2025 (TB-YOUTH screening study: NCT06033807). Contacts with positive IGRA were regarded as *M. tuberculosis* infected. A multilevel logistic regression model incorporating random intercepts for index cases, with adjustment for contact-level covariates, was employed to compare the risk of IGRA positivity between contacts of asymptomatic and symptomatic cases. Index-level confounding variables were balanced through stabilized inverse probability weighting (IPW).
Results: A total of 18,501 close contacts were included in the study, among which 9,056 (48.9%) were contacts of asymptomatic TB patients. The overall IGRA positivity rate was 10.1%. After adjusting for the smear status of index cases and contacts' characteristics (age, gender, BCG scar, other TB contact history), there was no significant difference in the risk of IGRA positivity between contacts of asymptomatic TB patients and those of symptomatic TB patients (adjusted odds ratio [aOR]: 0.90, 95% confidence interval [95% CI]: 0.76–1.07, $P = 0.23$). Subgroup analysis excluding the contacts whose index cases were clinically diagnosed cases showed similar result (aOR: 1.04, 95% CI: 0.90–1.19, $P = 0.59$).
Conclusions: Asymptomatic TB is not less infectious than symptomatic TB, and may play an important role in the transmission of *M. tuberculosis*. To achieve the goal of ending TB, it is necessary to pay attention to the early detection of asymptomatic TB and the medical evaluation of their contacts.

LB03-1323-21 Evaluation of MultNAT and PortNAT swab-based assays for Mycobacterium tuberculosis detection in Nigeria: A comparative study with Xpert MTB/RIF Ultra and Culture

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Background: The Global TB Report estimates that 10.8 million people fell ill with TB in 2023, however only 8.2 million case notifications were recorded. Despite global and national progress post-COVID, the TB notification gap persists—particularly in Nigeria with a 25% gap in 2023. This study evaluated two novel tongue swab-based TB assays to enhance point-of-care screening and strengthen surveillance, to improve case notification.
Design/Methods: 124 participants (54% men) and had their sputum and tongue swab specimens collected and processed according to the manufacturer's protocol, from February to June 2025. The study participants included individuals aged 15 years and older presenting with symptoms suggestive of TB, as well as people living with HIV who exhibited elevated C-reactive protein levels. All specimens were subjected to the novel tests, Xpert MTB/Rif and Liquid Culture (MGIT) Assays.
Results: A summary of the findings are seen in the table below. Both novel diagnostics were compared with Xpert MTB/Rif Ultra, and culture separately. PortNAT showed exceptional specificity (99 - 100%) and a Positive Predictive Value (94-100%), meaning almost all positive results are truly MTB-positive. Its lower sensitivity may however lead to more missed cases. MultNAT on the other hand, showed high sensitivity (87-88%), and a strong Negative Predictive Value (NPV) of 96-97%.

N - 124		Based on Xpert MTB	Based on Culture
PortNAT	Sensitivity	58%	56%
	Specificity	100%	99%
	PPV	100%	94%
	NPV	88%	88%
MultNAT	Sensitivity	87%	88%
	Specificity	99%	98%
	PPV	96%	92%
	NPV	96%	97%

Conclusions: PortNAT may play a significant role in confirmatory diagnosis, especially where overdiagnosis may be of concern, as in clinically diagnosed children, while MultNAT may be more suited for active case finding in the communities. The duality of both assays presents a strategic opportunity to phase TB diagnosis.

LB03-1324-21 Diagnostic accuracy of Pluslife MiniDock MTB using sputum and tongue swabs

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Background: Improved diagnostic tests are critical to identifying tuberculosis (TB) in high-burden countries. The MiniDock MTB Test (Guangzhou Pluslife Biotech Co., Ltd., China) is an automated molecular test that can process both sputum and tongue swab samples. We evaluated the diagnostic accuracy of the MiniDock MTB Test and compared to existing tests, sputum smear microscopy and Xpert MTB/RIF Ultra (Xpert).
Design/Methods: From September 2024 to March 2025, we consecutively enrolled people ≥12 years with presumed pulmonary TB in India, Nigeria, the Philippines, South Africa, Uganda, Vietnam, and Zambia.
Participants provided sputum samples for TB testing (smear, Xpert x1, liquid culture x2), and a tongue swab sample was collected. MiniDock was performed on tongue swabs and swabs dipped in sputum. Mycobacterial culture served as the reference standard. Sensitivity and specificity were calculated and compared with smear microscopy and Xpert using McNemar's test.
Results: Among 1380 enrolled participants, 603 (43.7%) were female, 255 (18.6%) were living with HIV, and 226 (17.4%) had culture-confirmed TB.
Sensitivity of sputum swabs tested on MiniDock was 85.7% (95% CI: 80.4–90.0), and specificity was 97.6% (95% CI: 96.4–98.4). With tongue swabs, sensitivity was 79.6% (95% CI: 73.8–84.7), and specificity was 99.5% (95% CI: 98.9-99.8).
Among those with valid results for MiniDock and Xpert, sensitivity of sputum swabs was similar to Xpert (86.7% vs. 89.4%, p=0.11).
Sensitivity of tongue swabs exceeded sputum smear (80.7% vs. 62.4%, p<0.001), and sensitivity was high among people requiring sputum induction (84.6%, 95% CI: 54.6–98.1).

Conclusions: The MiniDock MTB Test met WHO targets for both sputum and non-sputum based diagnostic tests. Sensitivity of both sample types exceeded smear, still widely used in many high-burden settings, and the sensitivity of sputum swab was comparable to sputum Xpert. Swab-based testing with MiniDock MTB Test shows promise as a near point-of-care method for TB detection.

LB03-1325-21 Evaluating the performance of computer-aided detection systems for pediatric tuberculosis: Results from the CAPTURE consortium

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Background: Computer-aided detection (CAD) systems are approved and used to interpret chest x-rays (CXRs) for tuberculosis (TB) screening in adults. However, their performance in pediatric populations remains under-evaluated, despite the unique radiographic and clinical presentation of TB in children.

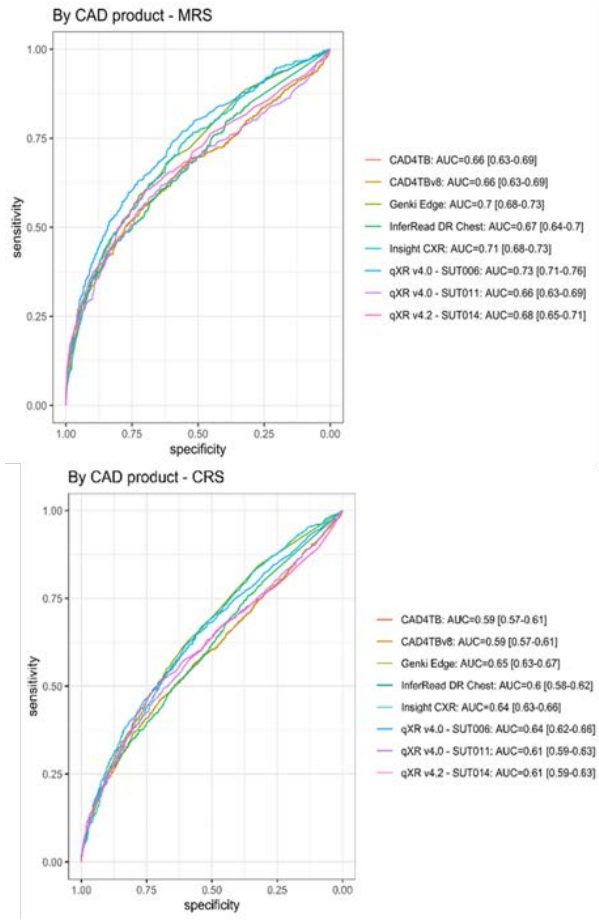
We aimed to evaluate the diagnostic accuracy of eight CAD products in children aged 0-14 year across diverse clinical settings

Design/Methods: We collected de-identified CXRs from children who were previously enrolled in TB diagnostic studies across ten high-burden countries. These CXRs were read by eight commercially available CAD products , and their TB prediction scores were compared against a microbiological and composite reference standard (MRS and CRS, respectively) according to the NIH TB classifications.

We calculated the area under the receiver operating characteristic curve (AUC), overall and by subgroups of age group, HIV status, and underweight status.

Results: We assessed 4760 CXRs from children with a median age of 2.5 years, 12% with HIV, and 24% who were underweight. Against the MRS, CAD systems were able to classify TB in children, with AUC (95% CIs) ranging from 0.65 (0.63-0.68) to 0.71(0.69-0.74). AUCs against the CRS ranged from 0.59 (0.58-0.61) to 0.64 (0.63-0.66).

Better performance was seen in age group 10-14 years than in younger age groups when compared to MRS-(AUC ranges: 0.75-0.80). CAD performance was similar by HIV status, but AUCs were higher in underweight children (AUC ranges 0.67-0.73).



Conclusions: Current CAD systems have suboptimal performance in children compared to adults, although they may have utility for adolescents and underweight children. These analyses underscore the importance of CAD systems being trained with pediatric images and child-specific thresholds to improve accuracy.

LB03-1326-21 Towards child-friendly TB diagnosis: An interim diagnostic accuracy analysis of SMaRT-PCR: A noninvasive mask-based TB diagnostic workflow

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Background: Tuberculosis diagnosis in children is challenging, as current diagnostic methods are predominantly invasive and suboptimal. Herein, we present interim results from our ongoing study evaluating diagnostic accuracy of SMaRT-PCR, a novel workflow integrating noninvasive mask-based aerosol sampling with reverse transcriptase-PCR (RT-PCR), for pulmonary tuberculosis (PTB) detection in children.

Design/Methods: The SMaRT-PCR diagnostic study aims to enroll 1200 children aged 1-14 years with presumptive TB from urban and rural settings. Currently, for the urban phase, children are being enrolled from tertiary hospitals and a TB clinic in Mumbai and Delhi, India.

Participants undergo a 10-minute mask sampling that captures bioaerosols using modified KN94-mask combined with RT-PCR for *Mycobacterium tuberculosis* (MTB)-specific gene transcripts and a conventional TB test involving gastric lavage/sputum/induced sputum collection, assessed using GeneXpert Ultra (Xpert-Ultra) and MTB culture.

We evaluated the diagnostic performance of SMaRT-PCR, Xpert-Ultra, and culture in comparison to composite reference standard (CRS), which includes microbiological and/or clinically confirmed TB with treatment initiation.

Results: Of 316 enrolled children, 97 with complete data were included for interim analysis. Among 27 children diagnosed with PTB, only 17 received microbiological confirmation.

In comparison of all three methods against CRS, SMaRT-PCR exhibited significantly higher sensitivity (30%, p=0.019) than Xpert-Ultra and 18.5% higher than culture (Table 1).

SMaRT-PCR had 95.3% specificity against CRS. The PTB diagnostic yield of SMaRT-PCR was 21%, compared to 13.6% for Xpert-Ultra, whereas by combining both test results, the diagnostic yield increased to 24.7%.

A - Analysis based on Diagnostic Classification

Diagnostic classification	SMaRT-PCR positive (Mask samples)	Xpert-Ultra Positive (Gastric Lavage/ Sputum/Induced Sputum)	Culture Positive (Gastric-lavage/ Sputum/Induced Sputum)
Pulmonary tuberculosis[1] (n=27)	21	13	16
Extrapulmonary tuberculosis[1] (n=23)	6	1	0
Latent tuberculosis[2] (n=2)	2	0	0
Disseminated tuberculosis (n=2)	0	0	0
Unlikely tuberculosis (n=43)	2	0	0

B - Diagnostic performance of novel and conventional tests for detecting pediatric pulmonary tuberculosis

Reference	Diagnostic Tests	Sensitivity (with 95% CI[3])	Specificity (with 95% CI[3])
Composite Reference standard	SMaRT-PCR	77.78% (58.6% - 90.9%)	95.35% (84.2% - 99.4%)
	Xpert-Ultra	48.15% (31.5% - 65.3%)	100.00% (91.8% - 100.0%)
	MTB Culture	59.26% (42.4% - 74.5%)	100.00% (91.8% - 100.0%)

[1] – Includes confirmed and probable TB cases
[2] – Children initiated on preventive TB treatment
[3] – 95% confidence interval calculated using Wilson's Score Interval

Table 1 - Diagnostic performance of SMaRT-PCR.

Conclusions: Preliminary results suggest that SMaRT-PCR has better sensitivity than conventional diagnostic tests, making it a promising noninvasive approach for pediatric TB detection. The complete sample size analysis will provide more accurate estimations of SMaRT-PCR's diagnostic accuracy across diverse settings.

A higher combined sensitivity of the two diagnostic tests suggests that SMaRT-PCR may serve as a beneficial complement to current diagnostic strategies, potentially improving detection rates.

LB03-1327-21 Pooling sputum specimens of people at high risk of TB reduces costs of Xpert Ultra TB testing without compromising concordance (TUTTPlus Study)

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Background: Scaling-up TB testing is critical to ending TB, but costs of molecular tests limit widespread use. Testing pooled sputum samples may reduce costs. We evaluated the concordance, and cost-efficiency of sputum pooling versus individual testing using Xpert MTB/RIF Ultra.

Design/Methods: We recruited 3,161 adult outpatients at high TB risk who donated a 3ml sputum specimen, split into two aliquots after processing: one tested individually and the other in pooled groups. If a pool tested positive constituent participant's individual results were reviewed. Pool sizes varied—initially 4 per pool; then 3 for samples from people living with HIV (PLWH); 5 for HIV-negative; and based on symptoms, pools of 4 for asymptomatic and 5 for symptomatic people, regardless of HIV status. Concordance and accuracy of pooled versus individual testing were analyzed considering "trace" results as positive, then, as negative for Mycobacterium tuberculosis (Mtb), and stratifying each pool by their constituent participants' majority HIV and symptom status. Time-motion studies and test costs informed cost comparisons, assuming only individual retesting of specimens from positive pools.

Results: Of 2,888 participants specimens included, median age was 40 years, 71% female, 76% PLWH, and 23.2% symptomatic for TB. Individually tested samples were positive for Mtb in 3.1% and "trace" positive in 1.1%. Concordance between pooled and individual tests ranged from 98.1% (95.3–99.3%) in pools of 3 to 88.5% (71.0–96.0%) in pools of 5, which had lower concordance than pools of 4. Assuming "trace" as positive increased concordance. Pools of 4 for PLWH and asymptomatic individuals yielded high concordance and reduced test costs compared to individual testing (Table).

	Unstratified	PLWH		Asympto-matic	Sympto-matic
Pool size (number of constituent participant specimens)	All pools combined	3	4	4	4
Specimens included (n)	2888	732	824	792	508
Pooling yield (%) (assuming trace as positive)	27.4	18.7	22.1	25.0	21.6
Concordance (95%CI) of pooling strategy to individual sputum testing. All Ultra tested	97.3 (95.4,98.5)	97.8 (94.6,99.2)	97.8 (95.5,98.92)	99.5 (97.0,99.9)	95.5 (92.2,97.4)
Cost (2025 USD)					
Pooled tested – Cost per person tested (Cost per TB positive diagnosis)	$5.59 ($142.80)	$6.21 ($324.46)	$5.35 ($191.93)	$5.36 ($169.65)	$6.02 ($161.00)
Individual tested – Cost per person tested (Cost per TB positive diagnosis)	$14.18 ($362.53)	$14.18 ($741.66)	$14.18 ($508.19)	$14.18 ($449.38)	$14.18 ($379.26)
Cost difference (%)	-60.6%	-62.1%	-62.2%	-62.2%	-57.5%

Table: Accuracy and modelled costs of a pooling strategy; testing pools of split participants' single sputum specimens – one aliquot tested individually and the other tested in the pool with varying pool sizes, and modelled costs of pooling assuming only positive pools were individually tested v. individually tested specimens.

Conclusions: Ultra-testing pooled sputum specimens is a cost-effective, accurate strategy for TB diagnosis, particularly pool sizes of 4 for PLWH and asymptomatic individuals. This approach could facilitate scalable TB testing in resource-limited settings, dependant on laboratory processes.

LB03-1328-21 Smarter screening, lower costs: A seven-country mixed-methods evaluation of novel TB diagnostic strategies from the Start4All consortium

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Background: Globally, one-in-four people with tuberculosis (TB) are missed. In Bangladesh, Brazil, Cameroon, Kenya, Malawi, Nigeria, and Vietnam, "Start4All" is evaluating diagnostic algorithms using commercially-available tools to enhance early TB diagnosis and care-linkage at primary healthcare (PHC).

Design/Methods: We recruited 4409 adults presenting to PHC with TB symptoms.

All participants had: capillary-blood C-reactive protein (CRP); sputum Xpert-Ultra (individual and pooled); and chest X-rays with computer-aided detection (CAD-CXR). Microbiological reference standard was sputum culture.

We compared costs and effectiveness of concurrent and sequential positive serial algorithms including CRP, CAD-CXR, and pooled and individual Xpert-Ultra.

We used Bayesian analysis to estimate diagnostic accuracy including sensitivity, specificity, positive/negative predictive values, and proportions of positive results.

Provider-perspective cost analysis included commodity and implementation costs. A decision-tree model estimated cost-per-person with TB detected, complemented by probabilistic sensitivity analysis.

Test feasibility and acceptability were evaluated through 38 interviews and 18 focus-groups with people with TB, healthcare workers, and policymakers across all countries.

Results: Ten diagnostic algorithms demonstrated promising performance, with >80% sensitivity and >95% specificity.

Of these, five offered substantial cost savings with only modest reductions in people confirmed with TB, when compared to individual Xpert-Ultra (Table).

CAD-CXR followed by pooled Xpert-Ultra, and CAD-CXR followed by individual Xpert-Ultra reduced costs by 69% and 67%, while detecting only 13% and 11% fewer individuals with confirmed TB, respectively.

Pooled Xpert-Ultra detected 2% fewer people with confirmed TB and reduced costs by 29%.

Sub-analysis by HIV status showed similar findings.

Stakeholders perceived all five algorithms to have moderate or high feasibility and acceptability, with adaptations suggested for scale-up.

	Xpert	CAD-CXR ->Xpert	Pooled Xpert ->Xpert	CAD-CXR or CRP ->Xpert	CAD-CXR -> Pooled Xpert ->Xpert	CAD-CXR or CRP -> Pooled Xpert ->Xpert
Performance analysis compared to sputum culture MRS						
Sensitivity % (95%CI)	89.6 (85.1, 93.1)	82.3 (77.3, 86.7)	86.7 (82.1, 90.5)	64.5 (79.7, 88.6)	80.1 (74.9, 84.8)	82.3 (77.2, 86.8)
Specificity % (95%CI)	97.2 (96.5, 97.7)	98.3 (97.8, 98.6)	98.0 (97.6, 98.4)	98.2 (97.8, 98.5)	98.6 (98.2, 98.9)	98.6 (98.2, 98.9)
PPV % (95%CI)	66.5 (60.8, 71.9)	74.9 (69.6, 79.7)	73.4 (68.2, 78.2)	74.9 (69.7, 79.7)	78.3 (73.1, 83.0)	78.3 (73.1, 83.0)
NPV % (95%CI)	99.3 (99.0, 99.6)	98.9 (98.5, 99.2)	99.2 (98.8, 99.4)	99.0 (98.7, 99.3)	98.8 (98.4, 99.1)	98.9 (98.5, 99.2)
DYT % (95%CI)	8.0 (7.2, 8.8)	6.5 (5.8, 7.3)	7.0 (6.3, 7.8)	5.7 (6.0, 7.4)	6.1 (5.4, 6.8)	6.2 (5.5, 7.0)
Modelled percentage cost savings and people with TB detected compared to individual Xpert						
Percentage reduction in cost relative to individual Xpert (%)	NA	66.5	25.3	20.3	69.1	27.5
Percentage reduction in people with TB detected relative to individual Xpert (%)	NA	11.2	1.9	5.9	13.4	8.9

Legend: Xpert = Xpert-Ultra. MRS = Microbiological reference standard. PPV = positive predictive value; NPV = negative predictive value; DYT = diagnostic yield amongst those tested ie. the proportion of individuals for whom the algorithm successfully identified they had TB among all individuals tested. Arrows between tests in an algorithm indicate the preceding test or tests were positive. For example, CAD-CXR or CRP -> Pooled Xpert -> Xpert is a modelled algorithm consisting of a first step of CAD-CXR or CRP and, if either or both of these tests are positive, a next step of pooled Xpert and, if the pooled Xpert is positive, a final step of individual Xpert. Cost model outputs were based on 100,000 simulations with 10,000 iterations each in a hypothetical cohort of 1,000 individuals.

Table. Modelled performance and cost savings of the most promising TB diagnostic algorithms at primary healthcare level.

Conclusions: In the multi-country Start4All study, low-cost, low-complexity diagnostic algorithms appeared feasible, acceptable, and able to maintain high diagnostic accuracy and yield, while reducing the cost-per-person with TB detected at PHC.
These findings support broader evaluation of algorithmic TB diagnostic approaches in high-burden, resource-limited settings.

LB03-1329-21 The diagnostic TB overture: Deep listening to hear what CXR can and can't see

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Background: Chest X-rays (CXRs) are valuable for TB screening and diagnosis but face major barriers to scale in primary care and resource-limited settings. Using an artificial intelligence (AI)-embedded point-of-need stethoscope, we developed a foundational TB diagnostic model to capture, classify and visualize audible and inaudible pulmonary abnormalities — vibrome biosignatures — mirroring the diagnostic patterns of CXR without the need for radiation or imaging infrastructure.
Design/Methods: We prospectively enrolled individuals aged ≥12 years with presumptive TB across Uganda, South Africa, India, Vietnam, and the Philippines. Each received a chest X-ray (CXR) and a 3-minute anterior-only vibroacoustic recording at six chest sites. A foundational model was developed using vibroacoustic data from 6,800 individuals with COVID-19, RSV, Influenza A/B, TB, or were healthy, paired with 21,000 multi-disease CXRs.
This model was then optimized to detect lung field abnormalities in enrolled individuals in reference to the CXR read by a radiologist or CAD software. Performance was evaluated on a 25% held-out dataset using five-fold cross-validation to compute AUROC, sensitivity, and specificity.
Results: We included 400 participants (median age 39 [IQR 29–52]; 45% female; 12% living with HIV). The 4,000 Hz vibrome biosignature alone classified abnormal CXRs with an AUROC of 0.779 (sensitivity 0.777; specificity 0.582). When combined with routine clinical covariates, performance improved to an AUROC of 0.836 (sensitivity 0.821; specificity 0.656). Prediction accuracy was higher when all six chest sites were used as compared to site-level accuracy. Notably, the model identified TB cases missed by CXR and resolved all indeterminate microbiologic reference standard (MRS) outcomes.

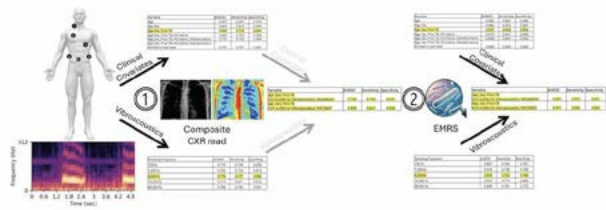

Figure 1: Music-of-the-body foundational model. Integrating clinical covariates (i.e., instrument shape such as age, sex, and prior TB) with inaudible and audible vibroacoustic signals to predict CXR findings and Extended Microbiologic Reference Standard (EMRS) outcomes. AUROC: Area Under the Receiver Operating Characteristic Curve. Yellow highlight=best performing algorithm. Just as music recognition systems identify full songs more accurately than isolated song segments, our vibrome biosignature-based approach demonstrates stronger performance at the patient level, capturing complex and distributed disease patterns that mirror the harmonic structure of the body's internal physiology.

Conclusions: Vibrome biosignatures technology decodes the "music of the body" and is able to identify and visualize lung abnormalities with high sensitivity and moderate specificity. This innovation has the potential to support TB screening and diagnosis without radiation, sputum, or facility infrastructure.

LB03-1330-21 Intensive screening reduces tuberculosis transmission over time in prisons

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Background: Few studies have prospectively evaluated the impact of intensified screening on Mtb transmission in high-risk settings. We leveraged serial QuantiFERON-TB Gold Plus (QFT) testing to estimate risk of infection over time in a longitudinal cohort undergoing intensive active case finding.

Design/Methods: In a prospective cohort of incarcerated adults (≥18 years) from two high-burden Brazilian prisons starting February 2023, participants underwent symptom screening, sputum testing with Xpert MTB/RIF and culture, and chest radiography every four months, with annual testing by interferon-gamma release assay (IGRA) using QFT. Individuals with negative QFT at baseline formed a subcohort.

The primary outcome was conversion to positive QFT during follow-up. Conversion rates and 95% confidence intervals were calculated using exact binomial tests. We fit a Poisson regression with fixed effects for prison to evaluate the association between time since study initiation (in years) and risk of QFT conversion.

Results: Among 614 individuals with a negative QFT at baseline and at least one follow-up result, 246 (40%) converted to positive (Figure 1).

Conversion risk declined from 48.8% (169/346) in the first year of the study to 28.9% (55/208) in the second year (p<0.001). Risk of conversion decreased by 41% per additional year of follow-up (RR: 0.59, 95% CI: 0.45-0.78). This decline was observed both among participants enrolled at study initiation and followed for two years, and among those newly enrolled and followed in the second year, suggesting that temporal trends in transmission, rather than cohort effects, were responsible for the reduction in QFT conversion.

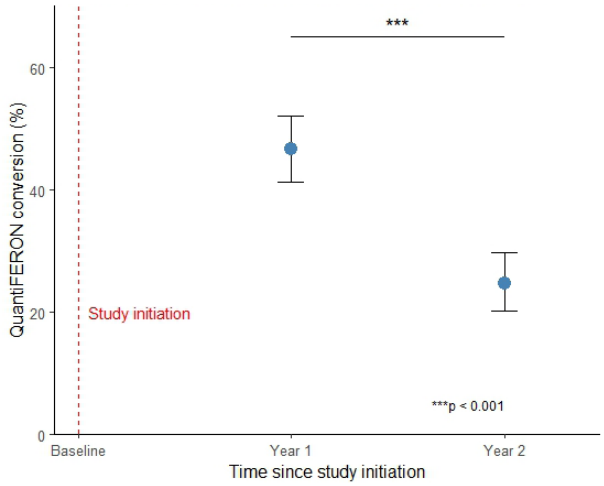

Figure 1. QuantiFERON conversion over time since study initiation.

Conclusions: These findings offer early evidence that intensified screening can reduce Mtb transmission in high-burden prison settings. Longitudinal monitoring of Mtb infection status in serial active case finding enables continuous evaluation of transmission impacts and identification of individuals eligible for preventive therapy.

TBSCIENCE ORAL PRESENTATIONS

TBS02-05 Clinical and transcriptomic risk factors for post-tuberculosis lung disease (PTLD) phenotypes in Kenyan adults

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Background: Post-tuberculosis lung disease (PTLD) affects half of pulmonary tuberculosis survivors, yet mechanisms remain unclear. We sought to identify clinical and host-response transcriptomic risk factors for PTLD restrictive and obstructive phenotypes.
Methods: In an observational, prospective, cohort study, we enrolled treatment naïve adults with pulmonary tuberculosis in Nairobi, Kenya. Participants completed 6 months of oral anti-tuberculosis treatment, blood draws at diagnosis and at treatment completion, and spirometry 6 months after treatment completion. PTLD was phenotyped as restrictive (low FVC) or obstructive based on spirometry.
Results: We enrolled 205 participants of whom 103 (50.2%) developed PTLD, 60 with restrictive-PTLD and 43 with obstructive-PTLD. Median age and proportion of women was similar amongst those with PTLD compared to those with normal lung function (34.2 years vs. 35.6 years and 22.3% vs. 24.5%, respectively). Clinically, at baseline those who developed PTLD had lower BMI, lower mid-upper arm circumference, and lower peak flow than those with normal lung function. In multivariable analyses, more quadrants involved on CXR at diagnosis was associated with both restrictive-PTLD (aOR 1.9, p<0.001) and obstructive-PTLD (aOR 2.2, p<0.001). Prior TB was associated with obstructive-PTLD (aOR 5.4, p<0.001). Clinical risk factors were otherwise similar. In transcriptomic analyses, those with restrictive-PTLD had upregulation of pro-fibrotic pathways including IL-6/JAK/STAT3 and TNF-α at baseline (FDR<0.2, Figure). This was no longer present at treatment completion. Those who had obstructive-PTLD had no differential gene expression at baseline but had ongoing inflammation at treatment completion including IFN-α and IFN-γ response (FDR<0.2, Figure).
Conclusions: PTLD is common and PTLD phenotypes have similar baseline clinical risk factors. However, PTLD-phenotypes have unique endotypes. Restrictive-PTLD was marked by early pro-fibrotic inflammation. Whereas those with obstructive-PTLD had ongoing inflammation at treatment completion. Our findings support the role of differential host response in the development of PTLD phenotypes.

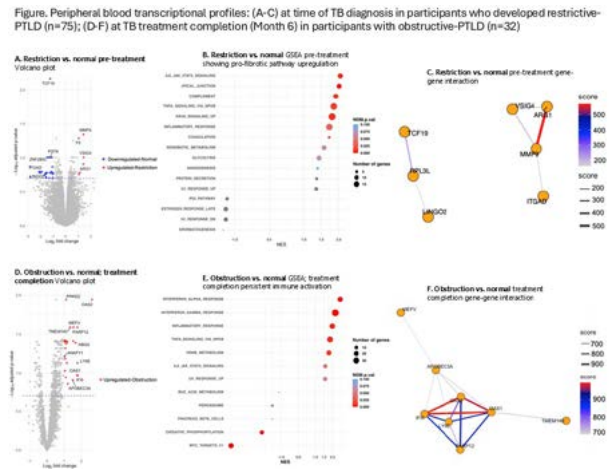

Figure. Peripheral blood transcriptional profiles: (A-C) at time of TB diagnosis in participants who developed restrictive-PTLD (n=75); (D-F) at TB treatment completion (Month 6) in participants with obstructive-PTLD (n=32)

TBS02-10 Integrative proteogenomics illuminates molecular drivers of *M. tuberculosis* virulence

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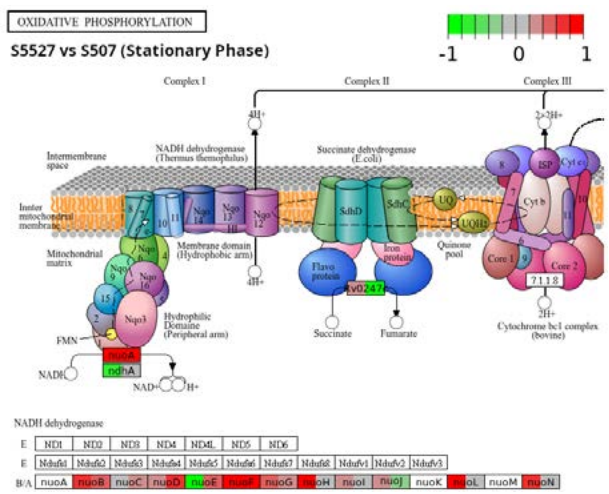
Background: Tuberculosis (TB) remains a leading cause of infectious mortality, where subtle molecular variations among *Mycobacterium tuberculosis* strains determine trajectories from latent infection to active disease. Integrative proteogenomics combining high-resolution mass spectrometry with genomic data can resolve these virulence determinants. We applied Progenio, a multi-strain proteogenomic pipeline, to two epidemiologically linked W/Beijing isolates with contrasting virulence to delineate molecular drivers of pathogenicity.
Methods: Hypervirulent S5527 and hypovirulent S507 strains of *M. tuberculosis* were cultured under mid-log, oxidative-stress, and stationary-phase conditions. Orbitrap LC–MS/MS spectra were searched with MaxQuant against six-frame ORF databases generated by Progenio,

which maps genomic peptides, annotates novel open reading frames (ORFs), alternative N-terminal translation start sites, interrupted coding sequences (ICDSs), and N-terminal acetylation events, then performs differential-abundance and gene-set enrichment analyses.

Results: From 818 580 submitted spectra, 346 305 (42.3%) were identified, yielding 21 652 unique peptides and 2 327 protein groups. Progenio revealed 7 novel coding regions, 17 alternative translation start sites, and 5 ICDSs. N-terminal acetylation mapping identified 110 proteins, with 17 unique to S5527 and 11 unique to S507, indicating altered post-translation regulation.

Stationary-phase analysis showed significant upregulation of the nuo operon (MT3233–MT3246) in S5527 (q = 0.089), implicating enhanced respiratory Complex I activity and suggesting NDH-1 inhibitors as candidate therapeutics. The mce1 operon (MT0172–MT0187) was downregulated in S507 (q = 0.065), indicating reduced lipid import, while the ESX-1 secretion system was enriched in S5527. Differential N-terminal acetylation of cell-wall enzymes (KasA and Pks13) highlights strain-specific post-translational regulation that may influence clinical trajectories.



Conclusions: Progenio's integrated ORF discovery, start-site variation, ICDS detection, and acetylation profiling identify proteogenomic signatures driving *M. tuberculosis* virulence. Enhanced Complex I expression, modulation of lipid-transport, and differential acetylation of cell-wall biosynthetic enzymes represent actionable targets for diagnostics and therapies, illuminating the microscopic frontiers of TB pathology.

TBS02-15 Impact of diabetes on macrophage and *Mycobacterium tuberculosis* interaction: Insights from dual RNA-seq

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Diabetes mellitus (DM) increases susceptibility to tuberculosis (TB), though the specific immune dysregulations contributing to this risk remain unclear.

We performed dual RNA-sequencing to capture transcriptional profiles of both host and pathogen. Human monocyte-derived macrophages (hMDMs) from individuals with type 1 diabetes (T1DM) (n = 12) and healthy controls (HC) (n = 12) were infected with *Mycobacterium tuberculosis* (*Mtb)* strain H37Rv, followed by gene expression and secreted cytokine level (T1DM; n = 17, HC; n = 17) analysis.

Our findings reveal that infected hMDMs from both T1DM and HC groups significantly upregulate genes linked to immune responses against bacterial pathogens. Despite comparable overall transcriptional responses, T1DM hMDMs showed a higher baseline activation of IFNγ but lower upregulation upon infection, with smaller fold changes of several pro-inflammatory genes compared to HCs. Secreted cytokine levels revealed only minimal differences between groups.

However, also on cytokine level, IFNγ concentration was lower for T1DM hMDMs compared to HC hMDMs upon infection. RNA-sequencing analysis of *Mtb* showed substantial transcriptional shifts when intracellular but no distinct differences between *Mtb* being intracellular in T1DM and HC macrophages. Upon infection, strong correlations between hMDM genes and *Mtb* genes were found.

This study demonstrates that while hMDMs from individuals with T1DM exhibit small transcriptional disparities, their response to *Mtb* infection largely mirrors that of HCs. Notably, both IFNγ gene expression and cytokine secretion were lower in T1DM hMDMs, which may contribute to the increased susceptibility to TB in individuals with T1DM. Our dual RNA-sequencing approach provides valuable insights into macrophage-*Mtb* interactions in both healthy and T1DM context.

TBS02-20 Proteins associated with neutrophil degranulation result in lung damage in symptomatic TB patients

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TB immunopathology is complex and multifactorial; however, neutrophils have recently emerged as crucial contributors to severe lung tissue damage. Over the past two decades, proteomics has provided critical insights into host–pathogen interactions. A significant knowledge gap remains regarding the proteomic landscape of TB lesions, which represent the primary site of infection and critical interface of host-pathogen interaction. Recent advances in proteomic technologies, coupled with access to human lung tissue, now offer a unique opportunity to characterize the proteome at the primary site of TB infection and to elucidate what drives lung damage in advanced TB disease.

We hypothesize that proteins associated with neutrophil degranulation contribute to lung damage in necrotic granulomata.

Thirty necrotic granulomas, representative of advanced symptomatic TB, were collected from resected diseased lung tissue from eighteen patients from KwaZulu-Natal, South Africa. The granulomata were precisely dissected using laser capture microdissection and analyzed by liquid chromatography-tandem mass spectrometry (LC/MS-MS) to identify host proteins.

LC/MS-MS analysis identified approximately 4,700 host proteins with high confidence across thirty necrotic granulomata. Among these, 2,290 proteins exhibited significantly altered abundance relative to healthy control tissue. Ingenuity Pathway Analysis identified neutrophil degranulation as the highest-ranked canonical pathway. Notably, proteins associated with neutrophil degranulation, namely, the cytochrome b558 subunits, CY24A and CY24B, critical components for reactive oxygen species production, along with myeloperoxidase, neutrophil elastase, cathepsin G, proteinase 3, and azurocidin-1, were in significantly higher abundance in necrotic granulomata compared to healthy controls.

Animal models have suggested neutrophil-mediated lung damage; however, direct evidence of this in human lung tissue has been lacking. Our findings demonstrate that proteins associated with neutrophil degranulation contribute to lung damage in human pulmonary TB. These proteins may serve as potential therapeutic targets for host-directed therapies aimed at modulating neutrophil-driven pathology in symptomatic TB.

TBS02-25 Studying the Influence of host Iron genotypes, iron supplementation and iron chelators on *Mycobacterium tuberculosis* complex infections in vitro

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Background: Tuberculosis (TB), driven by *Mycobacterium tuberculosis* complex (MTBC), remains a major global health threat. Iron is essential for MTBC survival and virulence, and the host tightly regulates iron availability to limit infection. However, common genetic variants in iron metabolism genes may alter this balance, influencing bacterial growth, immune responses, and therapeutic efficacy of iron modulation.

Objective: To determine how host iron-related genetic variants affect MTBC intracellular growth and the cellular response to iron supplementation and chelation, across key MTBC lineages circulating in West Africa.

Methods: We isolated monocytes from 60 healthy Gambian adults with known genotypes: ferroportin Q248H (n=17), TFR2 rs7385804 (n=29), and wild-type controls (n=12). Cells were infected with GFP-tagged clinical strains of Mtb Lineage 2 (L2), Lineage 4 (L4), or *M. africanum* Lineage 6 (L6), then treated with 100 μM $FeSO_4$ or 250 μM deferoxamine (DFO). Intracellular bacterial growth was measured over 7 days via GFP fluorescence. Oxidative stress (CellROX™) and GPX4 expression were assessed as markers of ferroptosis.

Results: Monocytes with the ferroportin Q248H variant exhibited significantly reduced bacterial growth across all MTBC lineages (L2: p=0.0008; L4: p=0.0005; L6: p=0.0025), while TFR2 variant cells supported higher growth, particularly of L4 strains. Iron supplementation promoted MTBC replication, especially in Q248H cells, but this was consistently reversed by DFO treatment. Iron loading increased intracellular ROS and reduced GPX4 levels, indicating ferroptosis activation.

These effects were most pronounced in TFR2 monocytes, which exhibited heightened oxidative stress and ferroptotic susceptibility. Both DFO and ferrostatin-1 significantly alleviated bacterial burden and restored redox balance.

Conclusion: Host genetic variation in iron metabolism modulates susceptibility to MTBC infection and response to iron-targeted therapy. Iron chelation reverses the pro-infective effects of iron loading across genotypes, supporting its use as a host-directed therapy in TB particularly where iron-loading genotypes and virulent lineages co-circulate.

TBS02-30 Unmasking hidden diversity: Direct sputum sequencing reveals extensive mixed-lineage TB infections missed by culture in a high-burden setting

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Background: Worcester, South Africa, has one of the highest tuberculosis (TB) incidence rates globally, with high rates of problem alcohol use (>50%) and HIV infection (~30%) among patients. In such settings, individuals are likely to harbour mixed infections or exhibit significant within-host *Mycobacterium tuberculosis* (Mtb) genetic diversity. Culture-based whole genome sequencing (WGS) may underestimate diversity due to selective outgrowth of dominant clones. We applied direct-from-sputum WGS to better capture within-host Mtb diversity in this high-transmission context.
Methods: We performed WGS directly from sputum and after culture in a prospective cohort of patients with drug-susceptible TB assessing Mtb diversity prior to antibiotic exposure. Low-frequency variants were identified using FreeBayes, a tool we identified in simulations to be top performing. We masked regions prone to contamination, homology, or low-confidence calls. A no-template and two H37Rv controls were processed alongside patient samples to monitor for contamination.
We identified mixed lineage infections and examined associations with clinical indicators such as time to culture conversion and time to positivity.
Results: We sequenced sputum and culture samples from 200 patients, of which 139 yielded high-quality data. Reduced diversity was observed in 42%, where mixed lineages in sputum resolved to a single lineage in culture. Concordant single lineages were seen in 37%, while 8% had single but discordant lineages between sample types.
Another 8% showed mixes in sputum and a non-matching lineage in culture. Only 5% had concordant mixed infections.

Description	Number of pairs
Complete Concordance Single	52
Completely Concordant Mix	7
Discrepant Single Lineages	11
Discrepant Multiple Lineages	11
Reduced Diversity	58
Total	139

Table 1: Counts of samples categorized by lineage diversity and concordance status.

These findings indicate frequent mixed lineage infection and loss or distortion of within-host diversity during culture. No evidence of contamination was detected in the no-template or H37Rv controls
Conclusions: In a high-burden setting, direct-from-sputum WGS revealed extensive within-host Mtb diversity and mixed infections missed by culture. These findings underscore limitations of conventional workflows and support integrating culture-free sequencing for accurate drug-resistance and transmission surveillance in this setting.

TBS02-35 Latent *Mycobacterium tuberculosis* infection is associated with increased inflammatory cytokines with dysregulation of antigen presentation pathways and innate immunity in diabetic individuals

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Background: Diabetes mellitus (DM) is a comorbid associated with worsened tuberculosis (TB) outcomes with less known about DM and latent TB (LTBI). We investigated the concomitant effects of LTBI and DM on the host through analysis of TB-antigen stimulated cytokines and host blood transcriptomes.
Methods: Participants included healthy individuals, those with DM, and all were tested for LTBI using IGRA testing. Therefore we studied healthy controls (EC, n=22), LTBI (n=29), DM (n=30) and DM-LTBI (n=19) groups. HbA1c > 6.5% g/dL was used to identify DM. Th1/Th2 cytokines were measured using the Bioplex assay. Blood RNA transcripts were investigated using microarrays. Transcriptome data was analyzed using GO pathways.
Results: TB-antigen stimulated IFN-g and IL-2 responses were raised in those with LTBI as compared with EC, and in DM-LTBI as compared with DM groups. The DM-LTBI group participants displayed raised levels of TNF-a (compared with LTBI), GM-CSF and IL-13 (compared with EC and DM). Host blood transcriptome analysis of study groups revealed 359 differentially expressed genes (DEGs): 187 DEGs between LTBI and EC; 182 DEGs between DM and EC, with 12 DEGs between DM-LTBI and EC groups.
In LTBI, there was downregulation of antigen presentation pathways (HLA-DQA1, HLADRB5). Comparing LTBI-DM and LTBI groups revealed upregulation of host adaptive, innate immunity and inflammatory (MMP9,

TLRs) pathways. GSE analysis of Wikipathways revealed upregulation of SARS-CoV-2 associated signaling pathways as well as IL-1-related inflammation associated with obesity.
Further investigation of transcripts in those who had DM-LTBI, comparing individuals with uncontrolled (HDM) as compared with controlled (CDM) diabetes revealed 488 DEGs, with upregulation of cell signaling and motility processes and downregulation of ribosome biogenesis.
Conclusions: We show that LTBI and DM synergistically increase host inflammatory and metabolic processes whilst reducing innate immunity, likely increasing susceptibility to pathogens.

TBS02-40 An imaging-based artificial intelligence (AI) system for diagnosing recurrent pulmonary tuberculosis

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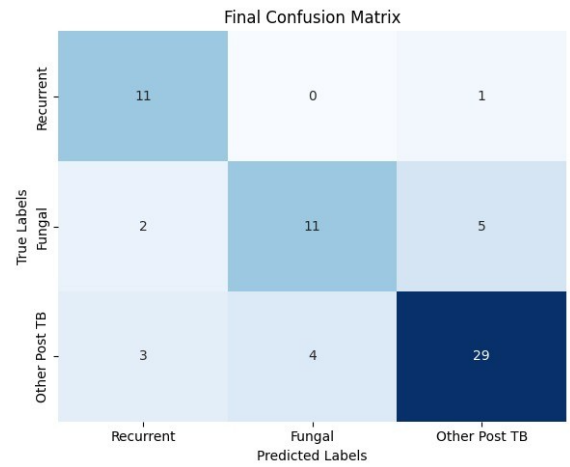
Introduction: Recurrent pulmonary tuberculosis (rPTB) poses diagnostic challenges due to considerable overlap with post-TB lung disease (PTLD) including chronic pulmonary aspergillosis (CPA) and poor microbiological yield. Computed tomography (CT) scans provide better accuracy than conventional chest X-rays at differentiating healed lesions from active disease; however, they require trained radiologists for interpretation. Training AI models to interpret CT scans can combine accuracy with faster diagnosis.
Objective: To develop and validate a computed tomography (CT)-based artificial intelligence (AI) model for differentiating rPTB, PTLD and CPA.
Methods: 66 patients with a history of past TB and new respiratory symptoms were studied. A convoluted neural network (CNN) model was trained on CT scans from these patients, using radiologist input and clinical/microbiological data. The scans were labelled by an experienced user, segmented using 3D Slicer (an open-source, medical image editing software), pre-processed and classified based on labels.
Classification was done using DenseNet Architecture, which utiilizes a deep learning model and Pyradiomics, an open-source Python package for extracting medical imaging data. The scans were then divided into 5 folds; each fold consisted of a training set and a validation set. The results of the 5 folds were combined to yield a final pooled confusion matrix.
Results: rPTB, PTLD and CPA was diagnosed in 12, 36 and 18 patients respectively.



The model's ROC achieved an AUC of 0.93 for diagnosing rPTB, with a sensitivity, specificity and accuracy of 91.67%, 90.74% and 90.91 % respectively. The final confusion matrix shows the actual diagnoses on the y-axis and the model's predictions on the x-axis.
Conclusion: The AI model reliably diagnosed rPTB and differentiated it from close clinical mimics. Further training and validation of this model might enable its use in communities with a high burden of rPTB.

TBS02-45 Expanding TB screening and triage through standardised sweep ultrasound and AI: Findings from a pilot study in Zambia

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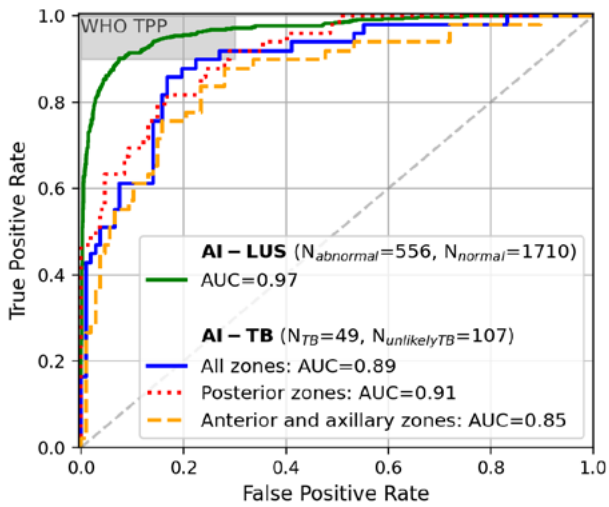
Background: Despite being preventable and treatable, tuberculosis (TB) remains underdiagnosed, with one-third of people with TB missed globally. There is a pressing need for scalable, cost-effective tools accessible in community and primary care. Handheld ultrasound offers a promising solution: it is portable, relatively affordable, radiation-free, and suitable for bedside use. Combined with artificial intelligence (AI) and a standardised sweep protocol, lung ultrasound (LUS) may enable TB screening without requiring specialised expertise.
Design/Methods: From March to December 2023, radiographers collected and interpreted LUS videos using a 5- or 16-zone sweeping protocol at a primary health

facility in Lusaka, Zambia. 809 symptomatic adults were enrolled (mean age 37.6±13.4 years; 61% male; 150/750 [20%] living with HIV; 110/679 [16%] with pulmonary TB) and received LUS. Blinded expert clinician and radiographer interpretations showed substantial agreement (Cohen's Kappa=0.68; 386 videos from 23 participants). An AI model optimised for mobile deployment was trained on 16-zone data to distinguish normal from abnormal LUS and predict TB using a composite reference of Xpert Ultra, urine lipoarabinomannan, and clinical diagnosis. Performance was evaluated on 2266 videos from 198 participants excluded from training (TB diagnosis for 156; 49 positive), comprising unseen 16-zone and all 5-zone data, at zone (AI-LUS) and participant (AI-TB) level.

Results: AI-LUS achieved an AUC-ROC of 0.97. AI-TB met WHO's screening target product profile (sensitivity>0.90 at specificity>0.70), using either a full-thorax or posterior-only protocol (see Figure). The latter significantly reduced scan time from 12.0±3.4 to 2.0±1.7 minutes. Incorporating TB diagnosis labels into training yielded marginal gain in AUC-ROC.



Conclusions: The findings demonstrate that a simple, standardised lung sweep protocol, combined with AI and integrated into a mobile application, is feasible and potentially effective. By bringing TB screening closer to the point of need, this tool may help identify people who would otherwise remain undetected.

TBS04-10 Widespread preexisting resistance to new and repurposed anti-tuberculosis drugs through loss-of-function

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Five New and Repurposed Drugs (NRDs) were approved in the last decade for treatment of multi-drug resistant tuberculosis: bedaquiline, clofazimine, linezolid, delamanid, and pretomanid. Unfortunately, resistance to these drugs emerged faster than anticipated, partly from preexisting resistance in naïve strains. Previous investigations into the rapid emergence mostly used short variants.

For the first time, we utilize *de novo*-assembled genomes, and systematically include Structural Variations (SV) and heterogeneity to comprehensively study this rapid emergence.

First, a systematic literature review revealed 313 NRD resistance variants in 13 genes.

Next, 409 globally diverse clinical isolates collected prior to the drugs' programmatic use (308 were MDR, 106 had *de novo* assembled genomes) were utilized to study the 13 genes comprehensively for conventional, structural, and heterogeneous variants. We identified 5 previously reported and 67 novel putative NRD resistance variants.

These variants were 2 promoter mutations (in 8/409 isolates), 13 frameshifts (21/409), 6 SVs (9/409), 35 heterogeneous frameshifts (32/409) and 11 heterogeneous SVs (12/106).

Delamanid and pretomanid resistance mutations were most prevalent (48/409), while linezolid resistance mutations were least prevalent (8/409).

Preexisting NRD resistance was highly prevalent in these strains (85/409, 21%), primarily through loss-of-function mutations in genes responsible for prodrug activation and efflux pump regulation. Loss-of-function mutations were similarly frequent throughout the genome, suggesting a wide bet-hedging strategy.

Hence, any future drugs resistible through loss-of-function in non-essential genes may similarly suffer from preexisting resistance, which will then spread rapidly upon programmatic use. This effect might be mitigated at early-stage drug design through comprehensive preexisting-resistance assessment.

TBS04-15 Safety and pharmacokinetics of bedaquiline in children aged ≥2<5 years with MDR-TB: 24-week results from Cohort 3 of the TMC207-C211 study

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Background: The TMC207-C211 study is a phase 2, open-label, multicenter, single-arm study to evaluate pharmacokinetics, safety, tolerability and anti-mycobacterial activity of bedaquiline in combination with a background regimen of multidrug resistant tuberculosis (MDR-TB) medications for the treatment of children and adolescents 0 months to <18 Years of age with confirmed or probable pulmonary MDR-TB. Data for ≥5 to <18-year-olds (cohorts 1 & 2) have been reported previously.
Methods: Children aged ≥2 to <5 years received bedaquiline (dosed at 8 mg/kg qd for 14 days, followed by 4 mg/kg tiw for 22 weeks) in combination with an individualized MDR-TB treatment regimen, with follow-up until 120 weeks. Primary objectives were safety, tolerability and PK of bedaquiline over a 24-week treatment period to inform on dosing recommendations. Safety parameters were analyzed descriptively. BDQ and M2 PK parameters were derived using noncompartmental (AUC24h, Cmax, tmax, and Cmin at Weeks 2 and 12; Cmin and t1/2 at Week 24) or popPK models (AUC168h at Wk12 and Wk24).
Results: 15 participants from Phillippines and South Africa, median age 3.8 years (range: 2 to 4.9 yrs), with confirmed (N=3) or probable (N=12) MDR-TB, were treated. No deaths, SAEs, or AEs leading to permanent discontinuation or temporary interruption of bedaquiline were reported. Two participants experienced a grade 3 AE, considered not related to bedaquiline. There were no occurrences of QTcF >460 ms. Individual bedaquiline AUC168h at Week 12 and Week 24 were within the 95% prediction interval of AUC168h in adults receiving the standard adult bedaquilne dose. GM AUC168s were within pre-specified target (60-140% of adult AUC168h, ss)

Pharmacokinetic parameters*	Day 14	Week 12	Week 24
AUC24h (ng.h/mL)	47,800 +/-27,000a	26,700+/-7,270b	-
AUC168h (ng.h/mL)	-	123,000+/-43,700	136,000+/-51,500
Cmax (ng/mL)	3690 +/- 2640	1810 +/- 872	-

* GM AUC168s were within pre-specified target (60-140% of adult AUC168h,ss)
Note: Expressed as mean +- standard deviation
a N=14 for AUC24h at Day 14
b N=10 for AUC24h at Week 12

Table: Pharmacokinetics of bedaquiline in Cohort 3 (≥2 to <5 Years of Age) TMC207-C211 study (N=15)

Conclusion: In children aged ≥2 to <5 years old with MDR-TB, 24 weeks of bedaquiline provided a comparable safety and pharmacokinetic profile to adults. This data will inform bedaquiline dosing recommendations, including children aged ≥2 to <5 years old.

TBS04-20 Decoding the role of ATF4 in pediatric tuberculosis by single-cell transcriptomics and metabolomics

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Background: Pediatric tuberculosis (TB) poses diagnostic challenges due to immature immune responses and non-specific clinical manifestations. Current diagnostic tools lack sufficient sensitivity. Activating transcription factor 4 (ATF4) has been implicated in immune regulation via amino acid metabolism; however, its role in pediatric TB remains unclear. This study aims to elucidate the ATF4-mediated metabolic-immune network using single-cell transcriptomics.
Design/Methods: Peripheral blood samples were collected from children with active TB (ATB), latent TB infection (LTBI), and healthy controls (HC). Single-cell RNA sequencing (scRNA-seq) was employed to profile immune cell subsets, and plasma amino acid metabolites were analyzed via LC-MS/MS. ATF4-deficient immune cell models were generated to assess its impact on Mycobacterium tuberculosis clearance in vitro.
Results: scRNA-seq revealed significant upregulation of ATF4 in monocytes and neutrophils of pediatric ATB patients, with co-expression of metabolic enzymes and immunosuppressive genes (PD-L1, IL-10). Metabolomic analysis identified abnormal levels of glutamine and tryptophan, which, combined with ATF4 expression, effectively distinguished ATB from LTBI. Functional assays demonstrated that ATF4 inhibition enhanced macrophage bactericidal activity and promoted $CD8^+$T cell proliferation and IFN-γ production.
Conclusion: ATF4 drives immune suppression in pediatric TB via metabolic reprogramming of monocytes and neutrophils. Its expression and associated metabolites may serve as novel biomarkers for early diagnosis. This study offers a new perspective on metabolism-immune crosstalk, providing a foundation for precision diagnostics and therapeutics in pediatric TB.
Summary: ATF4 regulates immune suppression through metabolic reprogramming in pediatric TB, with its expression and metabolites serving as potential biomarkers for early diagnosis and treatment, offering insights into metabolism-immune interactions for precision therapeutics.

TBS04-25 A machine-learning model of sequence, biochemical, and structural features to predict bedaquiline resistance in *Mycobacterium tuberculosis*

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Background: Bedaquiline (BDQ) is a core drug for rifampicin-resistant TB treatment.BDQ resistance is primarily caused by variants in the *Rv0678* gene.The WHO mutation catalogue classifies 97% of all missense variants in *Rv0678* as „*of uncertain significance*," limiting the clinical use of NGS diagnostics.
Methods: We performed a literature review to identify isolates with *Rv0678* missense variants that had corresponding MGIT phenotype data. After quantification of 13 sequence, biochemical, and structural features for each identified variant, we used AI methods (binary random forest classifier) to predict the BDQ phenotype. Hyperparameter tuning was implemented using Grid Search, and overfitting addressed using 5-fold cross-validation. Performance was assessed using Area Under the Curve (AUC) and F1 score. Clinical value was estimated by calculating the model's sensitivity and specificity, the proportion of variants classified as high, moderate and low probability of resistance, and the net reclassification improvement (NRI).
Results: The final model contained 5 features: evolutionary conservation, shortest atomic distance to key functional sites, biochemical differences between amino acids, impact on protein stability and dynamics in the ligand state, and effect on protein–protein interaction affinities in the DNA binding state. The final model achieved an AUC of 0.848 and F1-score of 0.853. For the 58 unique missense variants identified by the literature review, the model sensitivity was 91.6% and specificity 81.8%. Of the 159 variants classified in the WHO catalogue as 'uncertain significance', the model could classify 73 (45.9%) variants: 35 as high and 38 as having a low probability of BDQ resistance, with uncertainty remaining for 76 (47.7%) variants (moderate probability of resistance). For 149 variants listed in the catalogue, the NRI was +23.2%.
Conclusion: Using five sequence, biochemical, and structural features a machine learning model can characterize the impact of *Rv0678* missense variants and improve prediction of the BDQ phenotype.

TBS04-30 Evaluation of the drug resistance spectrum of *M. tuberculosis* in children from foci of multidrug-resistant tuberculosis

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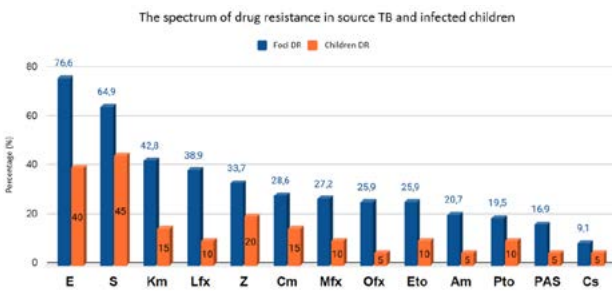
Introduction: According to the WHO Global tuberculosis (TB) Report, in 2023 only 37% of household contacts of smear-positive TB patients in the European Region received preventive TB treatment. In the Russian Federation in 2023, a high proportion of multidrug-resistant (MDR) strains was identified among children with bacteriologically confirmed TB: 37,3% in the 0–14 age group and 41,6% among adolescents aged 15–17 years.
Objective: To assess the spectrum of drug resistance in children from MDR-TB foci.
Methods: A retrospective analysis was performed on 406 medical records of children aged 0–17 years with respiratory tuberculosis treated at the National Medical Research Center for Phthisiopulmonology and Infectious Diseases of the Ministry of Health of Russia from January 2023 to May 2025.
Results: Among the 406 children, 166 (40,99%; 95% CI: 36,3–45,84) had known contact with TB patients. In total 89 cases (53,61%; 95% CI: 46,03–61,03) were exposed to MDR or pre-extensively drug-resistant (pre-XDR) TB strains. Resistance to more than four anti-TB drugs was documented in 67 cases (75,28%; 95% CI: 65,4–83,07). High resistance rates were found against levofloxacin in 30 cases (33,71%; 95% CI: 24,74–44,02). In 17 instances (85%; 95% CI: 63,96–94,76), the resistance profile matched in the source of infection and children with tuberculosis from MDR-TB foci. Preventive therapy following contact with MDR or pre-XDR TB patients was documented in only 18 cases (20,22%; 95% CI: 13,19–29,72).



Conclusions: Levofloxacin resistance in MDR-TB households reached 33,7%. A high concordance (85%) was found between drug resistance in source TB and infected children. Preventive treatment for children in MDR and

pre-XDR TB households was not given in 79,2% of cases. Empiric regimens were ineffective due to broad resistance, including to fluoroquinolones. There is an urgent practical need for effective preventive treatment protocols with new anti-TB drugs.

TBS04-35 Risk factors for unfavorable outcomes in four trials of bedaquiline and pretomanid-based regimens

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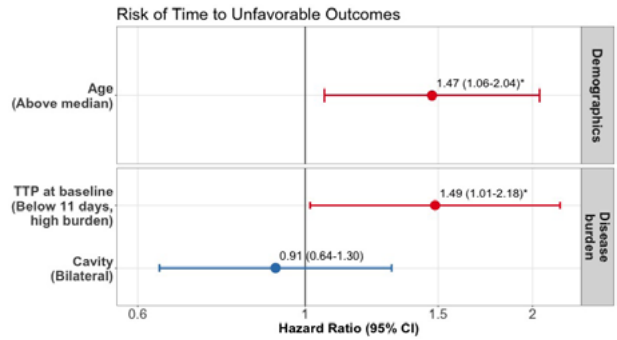
Tuberculosis (TB) remains one of the leading causes of death from an infectious disease. Bedaquiline (B) and pretomanid (Pa)-based regimens have been newly developed as promising regimens for TB; regimens containing BPa plus linezolid with or without moxifloxacin are recommended for the treatment of drug-resistant TB. Identification of risk factors related to TB-related unfavorable outcomes is a crucial first step to support the stratification of participants for future novel interventions.
We aimed to evaluate baseline risk factors for TB-related unfavorable outcomes in clinical trial participants treated with BPa-based regimens.
We compiled data from 4 phase 2–3 clinical trials (Nix-TB, ZeNix, TB-PRACTECAL, and SimpliciTB). Each clinical trial included BPa-based regimens combined with different drugs: clofazimine, linezolid, moxifloxacin, or pyrazinamide. Unfavorable outcome was defined according to the criteria specified in each trial including treatment failure and treatment discontinuation. We constructed univariate and multivariate Cox proportional hazards models to identify risk factors for time to TB-related and non TB-related unfavorable outcomes.
We considered the following baseline characteristics: age, sex, weight, height, BMI, HIV status, sputum smear grade, sputum culture time to positivity (TTP), *M. tuberculosis* (*Mtb*) drug resistance, and cavitary disease.
A total of 1,119 participants were included in the analysis. Age, smear grade, baseline TTP, *Mtb* drug resistance, and regimen composition were identified as potential independent risk factors from univariate analysis. Age and baseline TTP were retained in the final multivariate model of time to unfavorable outcomes after adjusting for the study and regimen. The hazard ratios (HR) (95% confidence intervals, CIs) of age above a median 35 years and baseline TTP below 11 days were 1.47 (1.06–2.04) and 1.46 (1.01–2.18).
This analysis demonstrated that older age and higher baseline burden of disease were associated with an increased hazard of unfavorable outcome in clinical trial participants receiving BPa-based regimens.



TBS08-10 Innovating TB diagnosis: A model-based evaluation of tongue swab molecular testing across four high-burden countries

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Background: Tongue swab (TS)-based molecular testing is an innovative, non-sputum sampling approach for tuberculosis (TB) diagnosis. With promising accuracy demonstrated in recent studies, TS testing has the potential to overcome key biological and operational barriers in current diagnostic pathways. We estimated the health impact and cost-effectiveness of TS-based testing strategies using MiniDock MTB (Guangzhou Pluslife Biotech), a near-point-of-care molecular platform, across four TB high-burden countries.

Methods: As part of the Tongue Swab Yield (TSwaY) study, we collected site-level cost data from primary care facilities in the Philippines, Uganda, Vietnam, and Zambia. A probabilistic decision-analytic model was developed to simulate three diagnostic strategies in settings with onsite Xpert MTB/RIF Ultra (Ultra): (1) replacement of sputum Ultra with TS MiniDock, (2) complementary TS testing for individuals unable to produce sputum, and (3) dual testing for individuals with a negative or no sputum Ultra result. Outcomes included disability-adjusted life years (DALYs) averted and incremental net monetary benefits (iNMB) across a range of willingness-to-pay (WTP) thresholds.
Results: TS-based replacement testing reduced diagnostic costs but led to fewer DALYs averted than the current standard in three of four countries. Complementary TS testing averted 24–54 additional DALYs per 1,000 individuals tested at an incremental cost of USD 242–955 per DALY averted compared to replacement. Dual testing conferred further health gains (8–14 DALYs/1,000) at incremental costs of USD 399–1,592 per DALY averted compared to complementary testing. iNMB analyses (Figure) identified dual testing as optimal at WTP thresholds ≥USD 500 (Philippines), ≥USD 750 (Uganda, Vietnam), and ≥USD 1,250 (Zambia).

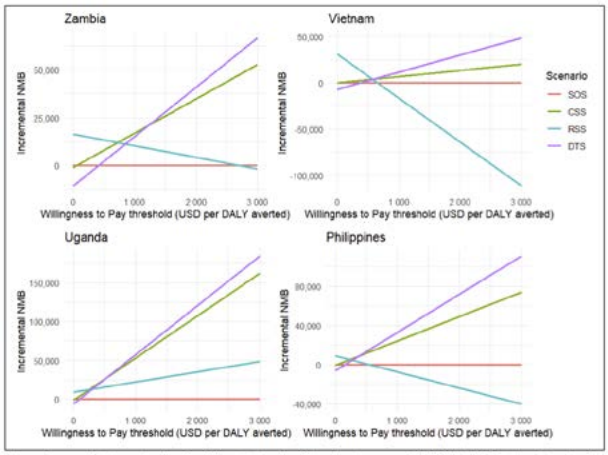

Figure: Incremental net monetary benefits of different strategies of integrating tongue swab (TS) MiniDock MTB testing into routine TB diagnostic algorithms in four TB high-burden countries: SOS = Sputum only scenario (base-case); CSS = Complementary testing scenario: TS is offered to people who are unable to produce sputum; RSS = Replacement scenario: TS replaces sputum-based testing; DTS = Dual test scenario: both samples are collected if possible, and TS-based molecular testing is processed for individuals with negative or no sputum Xpert Ultra result.

Conclusions: A combination of sputum-based and TS-based molecular testing, through complementary or dual testing strategies, can yield considerable health benefits at reasonable additional cost compared with sputum-based testing alone. These findings support the future integration of TS-based testing into TB diagnostic algorithms in high-burden settings.

TBS08-15 Nutritional markers and poor weight gain during tuberculosis treatment are associated with persistent inflammation and post-tuberculosis lung disease

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Background: Nearly half of persons with pulmonary tuberculosis (PTB) have ventilatory defects despite successful treatment. While undernutrition has been linked to an increased risk of poor treatment outcomes, its association with post-treatment lung function has not been investigated.
Methods: We enrolled adults with drug-sensitive PTB within 7 days of treatment initiation at clinics in Pune and Chennai, India. Plasma collected at enrolment and 2 months of treatment underwent multiplex ELISA for interferon gamma (IFN-g), tumor necrosis factor alpha (TNF-a), interleukin (IL)-1b, IL-6, IL-17, and IL-18 quantification. Spirometry was performed at successful treatment completion according to ATS/ERS standards. We measured associations of body mass index (BMI) and mid-upper arm circumference (MUAC) measured at enrolment, premorbid BMI estimated at the time of PTB symptom onset, and weight gain during treatment, with systemic inflammation and post-treatment lung function.
Results: Of 163 participants (57% male; median age 32 years), 72 (48%) had ventilatory defects – 52 (32%) had airflow obstruction and 27 (17%) had restrictive spirometry. The median (IQR) premorbid BMI, enrolment BMI and MUAC were 19 (17-21) kg/m$_2$, 18 (16-10) kg/m$_2$ and 22 (20-24) cm, respectively. After adjusting for potential confounders, higher premorbid BMI (aOR 0.79 per unit increment, 95%CI 0.68-0.91), enrolment BMI (aOR 0.81 per unit increment, 95%CI 0.70-0.91), enrolment MUAC (aOR 0.81 per cm increment, 95%CI 0.71-0.92), and a 10% or greater weight gain during 6 months of PTB treatment (aOR 0.41, 95%CI 0.18-0.91) were independently associated with lower odds of any post-treatment ventilatory defects. Conversely, lower BMI, MUAC, and <10% weight gain were associated with higher baseline levels and slower resolution of IL-6. Persistently elevated IL-6 levels were associated with higher odds of post-treatment ventilatory defects ($p<0.01$ for all).

Nutritional Metrics	Ventilatory defects	Baseline IL-6 levels	Month 2 IL-6 levels	Change[1] in IL-6 levels
	OR[2] (95% CI[3])	β[4] (95% CI)	β[4] (95% CI)	β[4] (95% CI)
Baseline BMI[5]	0.81 (0.70, 0.91)	-0.54 (-0.80, -0.29)	-0.15 (-0.42, 0.12)	-0.37 (-0.68, -0.07)
Baseline Premorbid BMI[5]	0.79 (0.68, 0.91)	-0.38 (-0.66, -0.11)	-0.15 (-0.42, 0.16)	-0.23 (-0.55, 0.09)
Baseline MUAC[6]	0.81 (0.71, 0.92)	-0.51 (-0.76, -0.24)	-0.06 (-0.34, 0.20)	-0.41 (-0.72, -0.11)
5 % 2 months bodyweight gain[7]	0.53 (0.23, 1.16)	0.11 (-1.83, 2.06)	-1.36 (-3.31, 0.57)	1.63 (-0.56, 3.83)
10 % 6 months bodyweight gain[8]	0.41 (0.18, 0.91)	0.38 (-1.53, 2.30)	-1.85 (-3.77, 0.06)	2.54 (0.29, 4.61)

Adjusted for sex, age, symptom duration (< 1 month or 1 month+), disease severity, ever-smoker, alcohol misuse, and diabetes.
1. IL-6 levels change from baseline to 2 months; 2. OR: odds ratio; 3. CI: Confidence Interval 4. β: linear regression coefficient; 5. BMI: Body mass index kg/m^2; 6. MUAC: mid-upper arm circumference kg/m^2; 7. 5% bodyweight gain after 2 months of PTB treatment; 8. 10% of bodyweight gain after 6 months of PTB treatment

Table 1: Adjusted association of nutritional metrics with post-treatment ventilatory defects and IL-6 levels (log transformed).

Conclusion: Undernutrition and poor weight gain are associated with increased and persistent systemic inflammation which may mediate risk of post-tuberculosis lung disease.

TBS08-20 Detection of aerosolised *Mycobacterium tuberculosis* DNA from adults with presumed pulmonary tuberculosis using an electrostatic sampler in a South African primary care setting

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Background: Non-sputum-based diagnosis of tuberculosis (TB) is a public health priority. Little is known about the feasibility of detecting Mycobacterium tuberculosis (*Mtb*) in respiratory aerosols in primary care, its diagnostic value, and the clinical and microbiological characteristics associated with detection.
Methods: We recruited symptomatic adults self-presenting to South African primary care clinics with a sputum Xpert MTB/RIF Ultra (Ultra) result. Two cough aerosol samples were collected from each participant using THOR, a novel electrostatic aerosol sampler, combined in the laboratory and tested by Ultra. Samples were collected at each clinic by participants coughing inside a dedicated booth with an internal volume of 1.9m^3 for 5 mins. Predictors of aerosol *Mtb* DNA (AMD) detection were assessed.
Results: Amongst 137 participants, 71 (52%) had medium or high and 34 (25%) had negative Ultra semi-quantitative results. Compared to sputum Ultra positivity, sensitivity of AMD detection in people with sputum Ultra high results was 56.9% (95%CI: 51.1-62.7) and specificity was 76.5% (95%CI: 70.4-82.5). Overall, AMD was detected from 56 (41%) participants. Factors associated with AMD detection were male sex with sputum Ultra semi-quantitative result greater than medium (aRR 3.26; 95%CI: 1.11-9.55; p=0.024) and reported fever (aRR 0.58; 95%CI: 0.29-1.07; p=0.099). AMD was detected in 8 (24%) people with negative sputum Ultra. Sputum-to-aerosol IS1081/6110 cycle threshold ratios in three participants was ≥0.75 suggesting a higher capacity to expel *Mtb* DNA. Despite rigorous decontamination, AMD was detected from 30% of environmental samples highlighting THOR's potent sampling capability and the risk to healthcare staff.

	aRR[1]	95% CI[2]	p-value
Sex: Sputum Ultra semi-quantitative result			
Female: ≤ low/negative	-	-	-
Female: ≥ medium	1.89	0.53, 6.7	0.571
Male: ≤ low/negative	1.13	0.3, 4.26	0.996
Male: ≥ medium	3.26	1.11, 9.55	0.024
Reported fever			
No	-	-	-
Yes	0.58	0.29, 1.07	0.099

[1]aRR = adjusted risk ratio;
[2]CI = Confidence Interval calculated with robust Standard Errors

Conclusions: Electrostatic aerosol sampling is feasible in primary care to detect people with infectious TB. More widespread use of aerosol sampling to detect TB might help to characterise predictors of transmission.

TBS08-25 Universal screening for asymptomatic TB among adults with household exposure to a patient with pulmonary TB

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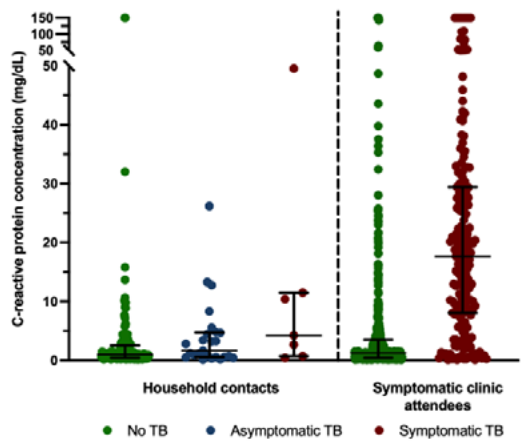
Background: More than half of TB detected by community prevalence surveys is classified as asymptomatic. We evaluated the yield of universal sputum bacteriological screening for asymptomatic TB among household contacts (HHC) in South Africa.
Methods: Adults (≥18 years) with household exposure to pulmonary TB patients were enrolled at three sites. Systematic screening of TB symptoms (any duration), chest radiograph (CXR; any abnormality), and sputum microscopy, Xpert Ultra, and liquid culture were performed. Serum C-reactive protein (CRP) was measured by multiplex bead array. Prevalent TB was microbiologically confirmed (Xpert Ultra or culture). Symptomatic and asymptomatic TB were defined as prevalent TB with and without reported symptoms, respectively.
Results: Between March 2021-December 2022, 979 HHC were enrolled; 185 (18.9%) living with HIV and 187 (19.1%) with previous TB. Prevalent TB occurred in 51 (5.2%) and was asymptomatic in 42/51 (82.4%). Only 13/42 (31.0%) asymptomatic TB cases were smear-positive [8/13 (61.5%) scanty or 1+]. CRP did not discriminate healthy HHC from those with asymptomatic TB (AUC 0.60; 95%CI 0.47–0.73; *Figure*).



An abnormal CXR was observed in 23/41 asymptomatic (sensitivity 56.1%, 95%CI 41.0–70.1%) versus 8/9 symptomatic (88.9%, 95%CI 56.5–98.0%) TB cases. Sensitivity of CXR with symptom screening was 64.0% (32/50, 95%CI 50.1–75.9%) for all prevalent TB.
Conclusions: More than 80% of TB cases among HHC were asymptomatic; CXR screening missed 40% of these. Community prevalence surveys reliant on symptom- and CXR-based approaches may significantly underestimate asymptomatic TB prevalence in endemic countries. CRP did not significantly differentiate asymptomatic TB from asymptomatic HHC without TB, suggesting CRP is not appropriate as a screening test in community settings.
These findings support the hypothesis that asymptomatic TB in the community, among persons not presenting for healthcare, is associated with less severe disease and less systemic inflammation than symptomatic TB among clinic attendees.

TBS08-30 Integration of ELISA and LAMP in a Novel urine-based assay: A visual, rapid, and non-invasive approach for diagnosing pediatric tuberculosis

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Background: Diagnosing pediatric TB is challenging due to its pauci-bacillary nature and difficulty in obtaining invasive samples.We aimed to identify *in vivo* expressed mycobacterial proteins in urine samples for the development of a rapid antigen detection assay for pediatric TB using a novel approach of integrating immunological and molecular techniques.
Methods: In this study, 210 pediatric pulmonary TB suspects were enrolled. Urine samples from culture-confirmed pulmonary TB cases (n = 8) and non-tuberculous controls (n = 8) were analysed using shotgun mass spectrometry. Selected TB-specific mycobacterial proteins were produced in recombinant form to develop an indirect antigen detection ELISA in urine.
Additionally, ELISA-LAMP assay was designed by conjugating an amino-modified reporter oligonucleotide to the secondary antibody, followed by isothermal amplification using LAMP primers and visual colour change detection.
Results: Thirty eight mycobacterial proteins were identified in urine, of which 17 were exclusively detected in TB. Two mycobacterial protein (DNA binding/ intermediary metabolism) were identified in maximum number of TB samples and evaluated for antigen detection ELISA development in urine samples both from TB and non-TB

subjects (n=25). ROC analysis to determine the optimal concentration-based cut-off providing maximum specificity showed promising results only for one mycobacterial protein (DNA binding). Cutoff for this protein was subsequently applied to blinded samples from a validation cohort comprising 156 pediatric pulmonary TB suspects. Decoding of results against a composite reference standard (CRS) comprising clinical, radiological, and microbiological findings, showed 75.0% sensitivity and 90.4% specificity for ELISA and 79% sensitivity and 89% specificity for ELISA-LAMP based on visual detection of colour change.

Conclusion: Mycobacterial proteins identified in urine samples show potential for non-invasive diagnosis of pediatric pulmonary TB. ELISA integrated with LAMP allows equipment-free, colorimetric detection suited for low-resource settings, though specificity need to be improved to meet WHO target product profiles for new tuberculosis diagnostics.

TBS11-10 Immunogenicity and efficacy of replication-limited or irradiation-inactivated BCG delivered intravenously to rhesus macaques

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Novel vaccines that prevent pulmonary TB in adults are urgently needed. Intravenous (IV) BCG vaccination protects against TB in highly susceptible rhesus macaques. Protection in this model correlates with antigen-specific CD4 T cells and NK cells in the bronchoalveolar lavage (BAL), among other immune features. Depletion studies in IV BCG-immunized macaques substantiate the requirement for CD4 T cells and CD8a-expressing cells in protection.

Given BCG is a live bacterial vaccine, its persistence in vivo is likely related to its protective efficacy. Non-replicating BCG might be better suited for IV delivery but its efficacy in this model is unknown. To address this, we vaccinated macaques with a live, replication-limited pantothenate BCG auxotroph (AUX), a non-live, irradiation-inactivated BCG (IRD), wild-type BCG (WT), or no vaccine (Unvax). Immune responses in the BAL and PBMC were measured longitudinally. Six months after BCG, animals were challenged with Mtb and bacterial burdens were quantified at endpoint.

Compared to Unvax (~5.6 log CFU), WT BCG mediated >4-log reduction in CFU (2 of 4 animals protected) while AUX BCG conferred a 1.8-log reduction (3 of 7 protected). In contrast, IRD BCG animals had similar burdens to Unvax (1 of 7 protected, ~5.5 log CFU). Together, these data indicate a hierarchy of protection related to the viability and replicative capacity of BCG. To look for immune features correlating with protection, we compared protected vs unprotected animals across all vaccine groups. In BAL, protected animals had a pronounced influx of lymphocytes after BCG with a significantly higher frequency antigen-specific CD4 T cell producing Th1/Th17 cytokines. Of note, unprotected animals had higher proportions of IL-17 in BAL and PBMC--driven largely by the IRD macaques. Ongoing transcriptional analysis in blood and BAL will provide further insight into the immune features defining protection and how it is influenced by BCG attenuation.

TBS11-15 Immunogenicity of the novel TB vaccine H107e/CAF®10b in BCG exposed, Mtb-uninfected adults in South Africa

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An effective vaccination strategy is urgently needed to combat tuberculosis (TB). We evaluated the immunogenicity of a protein subunit vaccine, H107e, adjuvanted with the novel liposomal adjuvant CAF®10b, in BCG-exposed, Mtb-uninfected adults from South Africa.

The H107e subunit protein consists of eight Mtb-specific antigens, not shared with BCG to broaden the antigenic repertoire. CAF®10b is designed to increase the magnitude of Th1, confer robust Th17-induction, a novel target for vaccine optimization, and promote mucosal homing of T cells.

A phase Ia open-label trial (nTB-01) was conducted. Healthy IGRA negative adults aged 18-45 years were enrolled into one of four study arms to receive two intramuscular injections 28-days apart; Arm 1-H107e antigen (n=5), Arm 2-CAF®10b adjuvant (full dose; n=5), Arm 3-H107e+low-dose CAF®10b (n=15), or Arm 4-H107e+full-dose CAF®10b (n=15).

Immunogenicity was measured using whole blood intracellular cytokine staining, dual IFNγ/IL-17 ELISpot, and IgG ELISA. After the second dose of H107e with CAF®10b at either dose, participants had significantly increased frequencies of H107e-specific CD4 T cells expressing IFNγ/TNFα/IL-2/IL-17 (median% of CD4 T cells 0.76% (95% CI 0.63-1.02%)) at day 43 compared with pre-vaccination ($p<0.0001$).

H107e-specific IL-17-producing T cells were significantly higher following vaccination at either dose compared to pre-vaccination (5.6-fold (95% CI, 2.0-12.4)), and H107e-

specific IgG responses were significantly higher in H107e/CAF®10b recipients (median units/mL, 95% CI; 41.1 (36.1-74.4) Arm 3, 104.8 (44.6-255.6) Arm 4) than H107e or CAF®10b alone (27.0 (6.2-78.2), and 3.5 (3.2-8.0)). Day 43 IGRA conversion, H107e contains ESAT-6, was observed in 70% adults receiving H107e/CAF®10b, and 53% of Arm 4 remained positive at day 85.
Thus, the H107e antigen and CAF®10b at two doses induces vaccine-specific Th1 and Th17 cytokine-expressing CD4 T cell responses, as well as antigen-specific IgGs in a cohort of BCG-exposed, Mtb-uninfected adults from South Africa.

TBS11-20 Diagnostic performance of tongue swabs for tuberculosis using two sampling durations with the Pluslife MTBC platform

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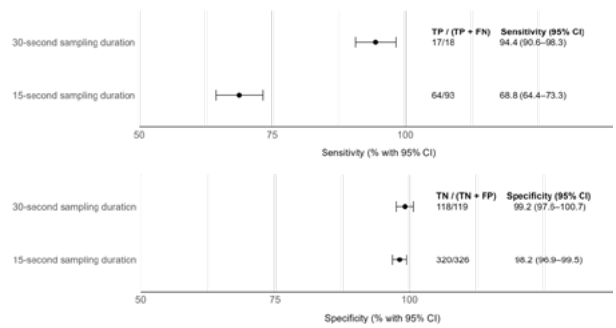
Background: Tongue swabbing is an emerging, non-invasive method for detecting tuberculosis (TB), particularly useful in low-resource and high-burden settings. Swabbing technique, including sampling duration, may influence diagnostic performance, but optimal parameters are still under evaluation. This study aimed to evaluate the diagnostic accuracy of tongue swabs using two different sampling durations -15 seconds and 30 seconds- on the Pluslife MTBC platform.
Design/Methods: From August 2024 to April 2025, we consecutively enrolled presumptive TB patients aged >28 days from a lung hospital, lung clinic, and seven community health centers in Bandung, Indonesia. Tongue swabs were initially collected by swabbing the dorsum for 15 seconds before sputum collection and processed using the Pluslife MTBC instructions for use (IFU). Midway through, the swabbing duration was extended to 30 seconds. Diagnostic accuracy -sensitivity, specificity, and 95% confidence intervals- was assessed against liquid culture.
Results: Among 419 participants in the 15-second swabbing group (58.0% male, median age 42 years), Pluslife tongue swab testing showed a sensitivity of 68.8% (95% CI: 64.4–73.3) and specificity of 98.2% (95% CI: 96.9–99.5) compared to liquid culture. In the 30-second group (n=137; 51.8% male, median age 13 years), sensitivity improved to 94.4% (95% CI: 90.6–98.3) with specificity of 99.2% (95% CI: 97.6–100.7). Of the seven patients who were Pluslife positive but culture negative, five were Xpert positive, two had a chest X-ray suggestive of TB.



Conclusion: Pluslife tongue swab testing demonstrated variable sensitivity related to sampling duration. The 30-second protocol met WHO minimum sensitivity and specificity thresholds for non-sputum, point-of-care TB tests. 'False positive' Pluslife cases were likely to have TB. Further research with larger populations is needed to validate these findings and inform standardized protocols for tongue swab-based TB diagnosis.

TBS11-25 Novel aptamer-based immunoassay targeting gastric lavage antigens for pediatric pulmonary tuberculosis diagnosis

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Background: Diagnosis of pediatric pulmonary tuberculosis remains challenging due to its paucibacillary nature. Infants and young children often swallow the sputum, thus making gastric lavage (GL) a valuable alternative for biomarker discovery. We aimed to identify *in-vivo* expressed mycobacterial proteins in GL samples from pediatric pulmonary tuberculosis and develop a rapid aptamer-based antigen detection assay.
Methodology: In this study, 200 pediatric pulmonary tuberculosis suspects were enrolled. GL samples from culture-confirmed TB cases (n = 8) and non-TB controls (n = 8) were processed for mass spectrometry via data-independent acquisition to identify Mtb specific antigens. Selected mycobacterial protein was produced in recombi-

nant form for the aptamers generation by SELEX process. The final-round aptamer pool was cloned and sequenced, followed by sequence alignment and structural prediction using Clustal Omega and Mfold, respectively. Aptamer candidates with the lowest predicted ΔG values were docked in silico with the target protein to assess binding affinity and interaction sites.
The affinity and specificity of selected aptamers were evaluated using immunoblotting and Aptamer-Linked Immunosorbent Assay (ALISA).
Results: Total 681 mycobacterial proteins were identified, among which 98 were uniquely detected in GL samples of confirmed TB subjects. A mycobacterial protein exhibiting the highest detection frequency in TB samples was selected for aptamer generation. The ALISA was initially developed using GL samples from 10 pediatric subjects each from the confirmed TB, probable TB, and non-TB groups, using selected aptamers.
ROC analysis of the data led to optimal concentration-based cut-off providing maximum specificity which was subsequently applied to blinded samples from a validation cohort of 150 pediatric pulmonary TB suspects. Result interpretation against a composite reference standard (CRS) incorporating clinical, radiological, and microbiological findings indicated 89% sensitivity and 90% specificity.
Conclusion: This study demonstrates the potential of a rapid, aptamer-based immunoassay for pediatric pulmonary tuberculosis diagnosis, especially valuable in high-burden settings.

TBS11-30 Boosting immunity: Screening immunomodulators for enhanced antimicrobial therapy in tuberculosis

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Tuberculosis (TB), caused by the pathogen *Mycobacterium tuberculosis* (*Mtb*), remains a global health threat due to drug resistance, poor treatment adherence, and high mortality rates. Host-directed therapies (HDTs) offer a novel approach to improve TB treatment outcomes by enhancing the host's immune defence, controlling inflammation, reducing post-TB complications and mortality. This study aimed to assess the potential of immunomodulatory compounds targeting Toll-like receptors (TLRs) 7/8, as adjunctive HDTs for TB.
For this study screening of the effects of immunomodulatory agents in THP-1 cells infected with the luminescent H37Rv *Mtb* LUX, was performed. The effects on the pro-inflammatory cytokines, TNF-α, IL-1β and IL-6 were quantified using ELISA.
Luminometry was used to analyse the effects of TLR modulation on bacterial clearance. A promising compound, TLR M, a TLR7/8 agonist, was identified as an activator of macrophage pro-inflammatory responses and underwent further evaluation using an in vitro 3D biomimetic TB granuloma model.
The effects on inflammation were measured using ELISA and antimycobacterial effects using luminometry. H&E-stained and immunofluorescent labelled slides were imaged using confocal microscopy to spatially analyse the association of TLR M's protein target, TLR7/8, with TB-induced inflammation and granuloma formation in resected TB-diseased lung tissue.
This study identified TLR7/8 as potential targets for adjunctive HDTs, revealing their potential to enhance the immune response response to *Mtb* infection and improve antimycobacterial properties. From TB diseased participants, we observed that alveolar macrophages contribute to TLR7/8 mediated signalling, potentially amplifying effector functions and aiding in *Mtb* clearance.
Taken together, TLR M represents a potential adjuvant HDT for TB treatment. The ability of this TLR7/8 agonist to modulate the inflammatory immune response and enhance antimycobacterial activity suggests that it can improve treatment outcomes and mitigate TB-related morbidity and mortality. Further research into TLR7/8-targeted therapies may therefore lead to enhanced strategies for combating TB.

TBSCIENCE MODERATED E-POSTERS

TBS-EP05 Distinct immune profiles in tobacco and biomass smoke-induced COPD: A comparative study across two populations

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Background: Chronic Obstructive Pulmonary Disease (COPD) is a major global health issue and the third leading cause of death worldwide. While tobacco smoke is the primary risk factor in high-income countries, biomass smoke (BS) from indoor cooking and heating is a key contributor in low- and middle-income countries (LMICs). Emerging evidence suggests that COPD driven by these exposures may constitute distinct disease phenotypes, but the immunological mechanisms underpinning this heterogeneity remain unclear.
Methods: This study compared two COPD-affected cohorts:
1. Well-characterised Australian patients hospitalised with tobacco smoke-induced COPD (TS-COPD), and;
2. A rural Papua New Guinea (PNG) population chronically exposed to biomass smoke.
Peripheral blood samples were analysed using flow cytometry and transcriptomics to identify immune cell phenotypes, cytokine profiles, and gene expression changes.
Results: In TS-COPD, CD4+ and CD8+ T-cells exhibited activated and exhausted phenotypes, with reduced expression of transcription factors linked to T-cell differentiation.
Mucosal-associated invariant T-cells (MAITs) showed high expression of exhaustion markers (CTLA4, PD1, TIM3). In the PNG BS-exposed cohort, symptomatic individuals demonstrated elevated Th17-related plasma cytokines and impaired T-cell function on stimulation.
Transcriptomic profiling revealed reduced expression of IL7R, CD96, and ITK in symptomatic BS-COPD individuals, in contrast to increased expression of these markers in TS-COPD. Gene enrichment analyses showed enhanced innate immune activity and reduced adaptive T-cell signals in BS-COPD.
Conclusion: Distinct immunological pathways underpin COPD in tobacco- versus biomass-smoke-exposed individuals. TS-COPD is characterised by T-cell exhaustion, while BS-COPD shows dysregulated Th17 inflammation and suppressed T-cell responsiveness.
These findings highlight the need for phenotype-specific approaches to COPD treatment, particularly in LMICs where biomass exposure is prevalent.

TBS-EP08 LyseTB - Comparative analysis of lysis devices for molecular testing of tuberculosis

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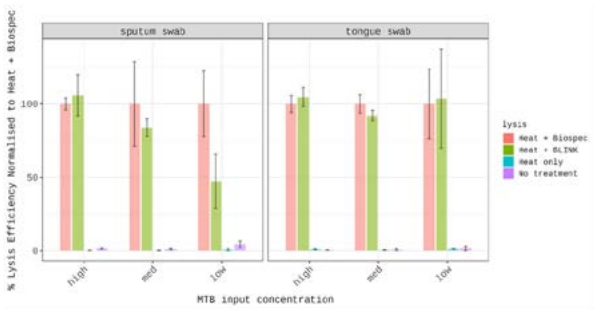
Background: Robust sample preparation, particularly lysis, of *Mycobacterium tuberculosis* (MTB) remains essential to maximizing sensitivity of swab-based molecular tests. Diagnostic companies are developing proprietary lysis devices, each employing distinct lysis mechanisms. However, there are limited comparative data on their performance for TB diagnosis.
This study aims to evaluate the performance of several devices, selected through systematic technology scouting, in processing tongue swabs and sputum-dipped swabs.
Methods: For each lysis device, we evaluate lysis efficiency across three clinically-relevant mycobacterial loads, nuclease inactivation, and biosafety. We benchmark performance against a reference method of 10-minute heat inactivation at 95°C followed by bead beating using the Biospec Mini-Beadbeater-16. Experiments are conducted on contrived tongue swabs and sputum swabs (*i.e.,* swabs swirled in sputum) spiked with known quantities of MTB H37Ra cells. We use qPCR to measure DNA recovery from the lysates.



Results: We have generated preliminary results for the BLINK X Shaker (BLINK AG, Germany), a portable, compact bead beater with capacity to process up to three samples. It showed lysis efficiency comparable to the ref-

erence method across high, medium, and low MTB loads in tongue swab samples (Fig1, right). However, in sputum swabs, performance dropped at low input levels (Fig1, left).

Conclusion: These findings highlight the BLINK X Shaker as a promising device for MTB lysis from tongue swabs, with further optimization needed for more complex matrices like sputum, particularly at lower bacterial loads. Evaluation of four additional devices is ongoing, with final results to be presented at the conference. Findings from this study will provide insights into optimizing sample preparation protocols, ultimately enhancing the accuracy and reliability of TB diagnostics.

TBS-EP11 Growth phase-specific DNA methylation bias manifesting as intercellular mosaic methylation in *Mycobacterium tuberculosis* clinical isolates

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DNA methylation plays diverse regulatory roles in bacterial pathogens, yet its dynamics remain poorly understood in *Mycobacterium tuberculosis* (*Mtb*). Here, we report intercellular mosaic methylation (IMM) by the orphan Type I methyltransferase MamC in a subset of fast-growing clinical isolates despite having wild-type mamC. Through PacBio long-read sequencing, we identified four *Mtb* complex isolates with anomalous hypomethylation at MamC-targeted sequence motifs. These "MamC-anomalous" isolates exhibited unique methylation heterogeneity, distinct from phase variation, indicating IMM, a phenomenon rarely documented for Type I methyltransferases.

We found that hypomethylation patterns in these isolates were linked to chromosomal replication dynamics. MamC methylation efficiency decreased progressively with distance from the origin of replication, with this positional bias markedly intensified in MamC-anomalous strains. By contrast, other *Mtb* methyltransferases (MamA, MamB) showed strand-specific but less pronounced positional methylation effects.

Using a refined peak-to-trough ratio (PTR) metric adapted for long-read sequencing, we show that MamC-anomalous isolates exhibit elevated and highly stable replication-linked coverage bias, consistent with unusually rapid and synchronized growth. These growth dynamics were not reflected in methylation patterns of MamA or MamB, suggesting a unique sensitivity of MamC activity to bacterial growth phase.

Together, our results uncover a growth phase-associated modulation of methylation efficiency, manifesting as intercellular mosaic methylation, a previously unknown relationship in *Mtb* epigenetics. This advances our understanding of *Mtb* DNA methylation systems and suggests functional links between replication state and epigenetic heterogeneity in clinical *Mtb* isolates with potential implications for adaptive diversification during rapid growth.

TBS-EP14 Potential pediatric tuberculosis incidence and deaths resulting from interruption in programmes supported by international health aid, 2025-2034: A mathematical modelling study

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Background: Children experience elevated risks of developing and dying from tuberculosis (TB). We estimated the additional pediatric TB deaths that could occur over 2025-2034 if programmes supported by United States bilateral health aid and the Global Fund to Fight AIDS, Tuberculosis, and Malaria (Global Fund) are discontinued.

Methods: We collated data on funding sources for TB and HIV programs in low- and middle-income countries and constructed scenarios representing reductions in health aid from 2025. Using calibrated transmission-dynamic models for 130 countries, we projected the discontinuation of TB and HIV treatment services under several funding reduction scenarios, and how this would affect pediatric TB exposure and treatment access. We projected pediatric TB incidence and mortality over 2025-2034 to calculate the impact of funding reductions.

Findings: Compared to maintenance of pre-2025 service levels, withdrawal of services currently supported by US bilateral health aid was projected to result in an additional 2.5 million (95% uncertainty interval: 1.8–3.3) pediatric TB cases and 340,000 (240,000–460,000) deaths over 2025-2034. Withdrawal of US support to the Global Fund and reduction in non-US contributions was projected to result in an additional million 8.9 (6.9–11.5) pediatric TB cases and 1.5 million (1.1–2.0) deaths, more than double the number expected with continued service levels. Impacts were greatest in Sub-Saharan Africa and South-East Asia (Figure). Restoration of services in 2026 led to a substantially smaller number of additional deaths.

Interpretation: Without actions to restore discontinued services, cuts to health aid for TB and HIV programs could result in large numbers of childhood TB deaths over the next decade.

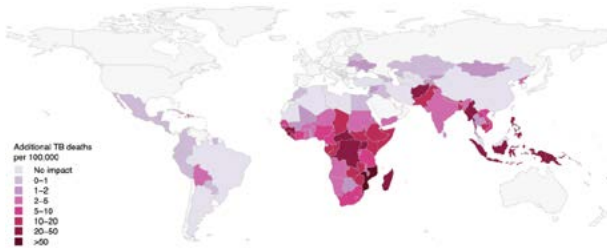

Figure: Additional childhood TB deaths over 2025-2034 with funding reductions, as compared to continued funding.
Scenario represents 100% of U.S. bilateral funding cut in 2025, plus 100% of U.S. and 50% of non-U.S. Global Fund contributions cut in 2026.

TBS-EP17 Spontaneous control of early Mycobacterium tuberculosis infection in children exposed to M. tuberculosis without standard treatment

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Mycobacterium tuberculosis (Mtb) infection in exposed children can progress to tuberculosis (TB) disease or be self-contained without treatment. Distinguishing exposed children who will control incipient *Mtb* infection from those who develop TB disease could reduce over-treatment but remains challenging. The T-cell activation marker (TAM)-TB flow cytometry assay has shown potential for diagnosing TB disease.
Here, we explore its use in children considered unlikely to have TB disease.

RaPaed-TB is a prospective TB diagnostic accuracy study in five low-middle income countries. The TAM-TB is based on *Mtb*-specific IFNγ$^+$CD4$^+$ T-cells expressing CD38 after ESAT6/CFP10 stimulation in children with suspected TB <15 years using predefined CD38 cut-offs.
Whole blood samples were collected at baseline and for up to six months post-treatment initiation. TAM-TB results were classified as positive (TAM$^+$), latent (TAM^{lat}), or negative (TAM$^-$). Participants were classified as confirmed TB (TB$^+$), unconfirmed TB(TB$^?$), or unlikely TB (TB$^-$) following adapted NIH guidelines.
Of 203 children classified as TB$^-$, 30 (15%) were TAM$^+$ at baseline, suggestive of active TB infection. 90% (27/30) had a positive Tuberculin Skin Test (TST) and 93% (28/30) reported recent TB contact, mostly household members.
Within these 30 TB$^-$TAM$^+$children, a significant decline in median IFNγ$^+$ CD38-expression was observed (59.4% vs 37.5%, p<0.002) at month 1, where 30% (9/30) had converted to TAM^{lat} and 3.3% (1/30) to TAM$^-$, which was comparable to TB$^+$ on treatment reflecting an induced decline of MTB-specific T-cell activation.
Compared to children considered TB$^-$TAM$^-$, this TB$^-$TAM$^+$ group was significantly more likely to have a positive TST (p<0.001) and recent TB contact (p<0.001). 33.3% (10/30) were initiated on TB preventive treatment (p<0.003), while 66.7% (20/30) had not received any treatment for TB disease.
These findings suggest spontaneous control of active *Mtb* infection in children considered TB$^-$, but with immunological evidence of *Mtb* exposure and TB disease at baseline.

TBS-EP20 The Treatment Recommender: An AI-powered decision aid for a stratified precision medicine approach to rifampicin resistant tuberculosis treatment

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Introduction: The BPaLM regimen revolutionized rifampicin-resistant tuberculosis (RR-TB) treatment. Linezolid toxicity and bedaquiline resistance increasingly requires doctors to design individualized rescue regimens. The endTB-Q trial demonstrated that fluoroquinolone-resistant TB (FQ^R-TB) treatment should be stratified by disease severity and that extensive FQ^R-TB disease may require individualized treatment regimens.

Methods: We developed a Treatment Recommender for stratified precision medicine using targeted next generation sequencing (tNGS) or whole genome sequencing (WGS) data. International expert opinion was gathered to define optimal treatment strategies. Within each strategy, the recommender model selects the optimal regimen composition based on individual drug features and regimen features. The recommender model was developed using AI-methods to analyze 1,972 feedback datapoints from 21 global RR-TB experts during 5 training rounds. Success was defined as the majority of experts accepting the recommended regimen.
Results: The Treatment Recommender version 2 was built to be conform to recent guidelines, emerging data, and adheres to 7 principles: [1] administer BPaLM whenever tNGS or WGS classifies all 4 drugs as susceptible, independent of prior exposure, [2] include B, Pa/DLM and L whenever these drugs are possibly effective, [3] limit the use of the BDLC (bedaquiline/delamanid/linezolid/clofazimine) regimen to FQ^R-TB with limited disease, [4] strengthen the BDLC regimen in case of extensive FQ^R-TB disease, [5] strengthen regimens in case of possible resistance to B, Pa , D or L, [6] compose individualized regimens with six drugs, and [7] prioritize oral drugs when a sufficiently strong all-oral regimen can be designed. After 5 training rounds, the Treatment Recommender model achieved an overall 83% success rate, 100% for 5-drug strengthening regimens and 76% for 6-drug individualized regimens.
Conclusion: AI-based clinical decision aids can facilitate the implementation of NGS-guided precision medicine in high burden settings and guide doctors to implement stratified and personalized treatment for patients suffering from complex RR-TB disease.

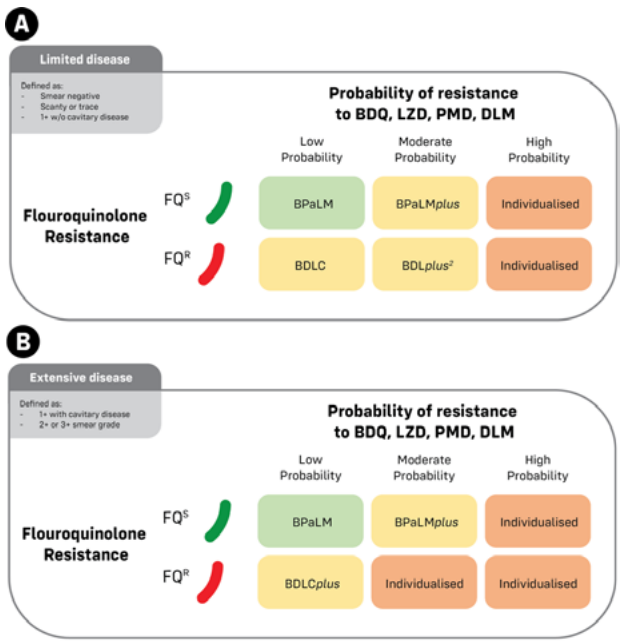

Figure 1: Daigram illustrating the regimen strategies employed by the Treatment Recommender, stratified by whether the patient is suffering from (A) limited disease or (B) extensive disease

TBS-EP23 Interred mechanisms of resistance and host immune evasion revealed through network-connectivity analysis of *M. tuberculosis* complex graph pangenome

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Mycobacterium tuberculosis complex successfully survives environmental pressures through mechanisms of rapid adaptation which remain poorly understood despite knowledge gained through decades of research.
In this study, we used 110 reference-quality, complete *de novo* assembled, long-read sequenced clinical genomes to study patterns of structural adaptation through a graph-based pangenome analysis, elucidating rarely studied mechanisms that enable enhanced clinical phenotypes offering a novel perspective to the species‘ adaptation.
Across isolates, we identified a pangenome of 4,325 genes (3,767 core and 558 accessory), revealing 290 novel genes, and a substantially more complete account of difficult-to-sequence *esx/pe/pgrs/ppe* genes.
Seventy-four percent of core genes were deemed non-essential *in vitro*, 38% of which support the pathogen‘s survival *in vivo*, suggesting a need to broaden current perspectives on essentiality. Through information-theoretic analysis, we reveal the *ppe* genes that contribute most to the species‘ diversity-several with known consequences for antigenic variation and immune evasion.
Construction of a graph pangenome revealed topological variations that implicate genes known to modulate host immunity (*Rv0071-73, Rv2817c, cas2*), defense against phages/viruses (*cas2, csm6,* and *Rv2817c-2821c*), and others associated with host tissue colonization.
Here, the prominent trehalose transport pathway stands out for its involvement in caseous granuloma catabolism and the development of post-primary disease.
We show paralogous duplications of genes implicated in bedaquiline (*mmpL5* in all L1 isolates) and ethambutol (*embC-A*) resistance, with a paralogous duplication of its regulator (*embR*) in 96 isolates. We provide hypotheses for novel mechanisms of immune evasion and antibiotic resistance through gene dosing that can escape detection by molecular diagnostics.

TBS-EP26 Single-cell RNA sequencing of cerebrospinal fluid in HIV-associated tuberculous meningitis

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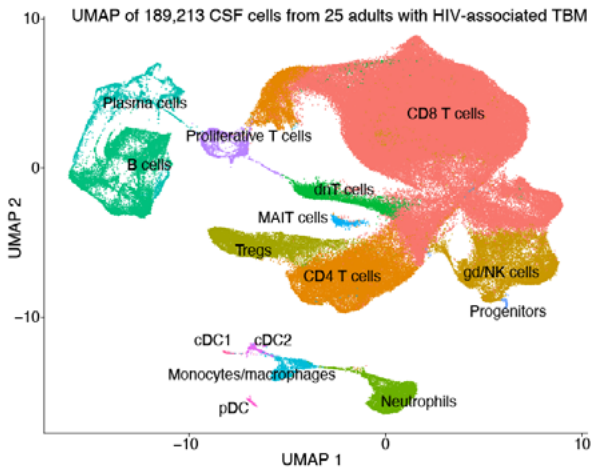
Tuberculous meningitis (TBM) causes death in a quarter of cases, and a third of survivors suffer persistent neurological disability. In people living with HIV, mortality exceeds 50%. Death and disability are contributed to by immune dysregulation, and adjunctive host-directed therapies aim to modulate this response to improve outcome. Developing such therapies relies on improved understanding of the immune response during TBM.
To investigate this response, we performed single cell RNA sequencing on 25 cerebrospinal fluid (CSF) samples from adult TBM patients living with HIV in Cape Town enrolled into a clinical trial. Lumbar CSF was taken seven days following enrolment. The median age, CD4 count and viral load at enrolment were 37 years, 115 cells/mm³, and 59,389 copies/ml respectively. 10/25 (40%) had a reduced Glasgow coma score or focal neurology at enrolment. 14/25 (56%) were microbiologically confirmed with a positive *M. tuberculosis* culture or GeneXpert Ultra result.



189,213 cells were analysed following quality control and doublet removal. Results reveal a CD8 T cell predominance with abundant granzyme and perforin expression and great heterogeneity in cell type proportions between patients. We identified a significant population of neutrophils, which associate with mortality in TBM, and are rarely captured by single cell RNA sequencing. We will report correlations between cell type proportions, cellular phenotypes, microbiological confirmation and clinical severity, and relate these findings in a larger cohort investigated by untargeted and targeted CSF proteomics.
This is the first single cell RNA sequencing study to examine the immune response to TBM in people living with HIV, and the largest to investigate an infectious aetiology of any type in the CSF. These data help us to understand the immune state of the CSF during *M. tuberculosis* infection at a resolution never before seen and generate novel hypotheses for future host-directed therapies.

TBS-EP29 *In vitro* characterization of GSK2556286 activity in combination with bedaquiline and pretomanid against *M. tuberculosis*

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The search for improved chemotherapy with drugs having different mechanisms of action remains crucial for the complete eradication of *Mycobacterium tuberculosis* (Mtb). GSK2556286 (GSK286), a novel drug candidate, combined with bedaquiline (B) and pretomanid (Pa) has shown promise in improving tuberculosis treatment.
In this work, the main aim was to explore, in an *in vitro* manner, the interaction between GSK286 and the core BPa backbone and the individual contribution of each compound or pairwise combination to the general combination.
Dose-response time kill assays (TKA) with different concentrations of GSK286 used alone or in combination with BPa at matching EC10 and EC50 against Mtb H37Rv were carried out. Overall, the combination of GSK286 + BPa exhibited maximal killing effect when BPa was applied at its EC50. However, the interaction was primarily influenced by the BPa backbone. Reducing concentrations of B and Pa revealed that the pairwise GSK286 + B com-

bination exerted a more favorable interaction compared to both GSK286 + BPa and BPa combination. Moreover, these results were confirmed with a THP-1 intracellular kinetic assay, verifying the intracellular activity against Mtb for the combination GSK286 + B + Pa, as well as the favourable interaction of the pairwise GSK286 + B.
These findings provide valuable insights into the synergies and limitations of these drug combinations, paving the way for further investigations and development of an optimal approach to treat tuberculosis.
This work has received support from the Innovative Medicines Initiatives 2 Joint Undertaking (grant No 853989). This work reflects only the author's views, and the JU is not responsible for any use that may be made of the information it contains.

TBS-EP32 Machine learning model for community-based tuberculosis screening: A proof-of-principle study

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Case detection for Tuberculosis (TB) remains a challenge, with millions of new cases remaining undetected each year, a phenomenon known as the diagnostic gap. The WHO-4-symptoms screening (W4SS) is widely utilized for screening, but excludes contextual information (e.g. comorbidities) and proves not sufficiently accurate.
We aimed to address the current limitations of TB screening algorithms by leveraging machine learning (ML) to develop a TB risk prediction model for community based TB screening.
For model development, three datasets were harmonized: two prevalence surveys (PS) and one community-randomized study, all conducted in South Africa and Zambia (N= 118808). The merged harmonized dataset was split for model training (80%) and internal validation (20%). A fourth PS dataset from South Africa was set aside for external validation (N= 27350).
A composite reference, based on microbiological results and prolonged cough, was used to define the "Possible TB" category. Missing data were handled using multiple imputation separately for the internal and external datasets. Relevant input variables were selected based on domain knowledge.
The model was developed using Extreme Gradient Boosting (XGBoost), and to address class imbalance, inverse class weighting was applied. Model performance was evaluated on the internal and external validation datasets using precision, recall, F1-score, balanced accuracy, and AUC. For comparison, W4SS was assessed in parallel on the same datasets. The ML model outperformed W4SS to predict 'Possible TB' cases with higher sensitivity in both internal (73% vs. 52%) and external validation (69% vs. 17%), and demonstrated more robustness across the datasets.

	Internal Validation				External Validation			
	Precision	Recall (Sensitivity)	F1-score	Balanced Accuracy	Precision	Recall (Sensitivity)	F1-score	Balanced Accuracy
Unlikely	0.95	0.83	0.88		0.92	0.74	0.82	
Possible TB	0.40	0.73	0.52	0.78	0.35	0.69	0.47	0.72
Average	0.68	0.78	0.70		0.64	0.72	0.65	

Table 1. Key performance metrics of the XGBoost model in the internal and external validations.

Further exploration of state-of-the-art machine learning approaches, and incorporating additional, diverse datasets are planned, with the ultimate goal of meeting the WHO target product profile for TB screening and integrating the model into an accessible screening app.

TBS-EP35 Quantitative IFNγ Responses from QuantiFERON-TB Gold Plus Predict Progression to Active Tuberculosis in Global High-Burden Settings

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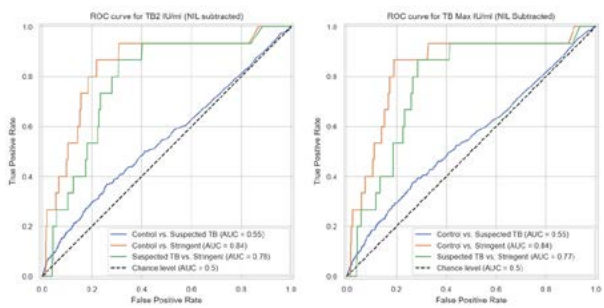
Introduction: A predictive biomarker for tuberculosis (TB) progression would transform targeted prevention efforts and clinical trial design. Although interferon-gamma release assays (IGRAs), including QuantiFERON® TB-Gold Plus (QFT-Plus), have been studied for this purpose, systematic evaluation of quantitative IFNγ responses to the QFT-Plus TB1 and TB2 antigens remains limited, particularly in high burden settings.
Methods: An exploratory analysis was conducted within a large, prospective study of 5,259 participants from TB-endemic regions. QFT-Plus TB1 and TB2 IFNγ concentrations were assessed at baseline and analyzed in relation to subsequent TB outcomes over ≥12 months follow-up. Participants were classified as controls (no TB), suspected TB (no microbiological confirmation), or laboratory-confirmed TB, including a subset meeting a stringent case definition (≥2 positive microbiologic tests). Associations between baseline IFNγ concentrations and TB progression were assessed using non-parametric statistics and Receiver Operating Characteristic (ROC) analysis.
Results: Independent of IGRA status, baseline TB2 and maximum IFNγ concentrations (highest of TB1 or TB2) were significantly higher among participants who later

were suspected of TB, had laboratory-confirmed TB, or met the stringent TB case definition. Associations with baseline TB1 IFNγ concentrations and disease progression were observed only when considering QFT-Plus as a continuous variable (including IGRA+/-) and in participants meeting the stringent case definition. Under this stringent definition, TB2 and maximum values achieved an Area Under the Curve of 0.84, with sensitivity of 80% and specificity of 78–81% (Fig 1). However, positive predictive values (PPV) for TB progression within two years were low across measures (1.0–1.3%).



Conclusion: In high-burden settings, QFT-Plus TB2 and maximum TB1/TB2 IFNγ concentrations were associated with progression to TB disease. Although limited by a relatively short follow-up and few TB cases potentially impacting the observed PPV, these markers show promise as risk stratification tools or components of composite biomarkers in future research applications.

TBS-EP38 Sputum metabolites correlated with lung function during and after TB treatment

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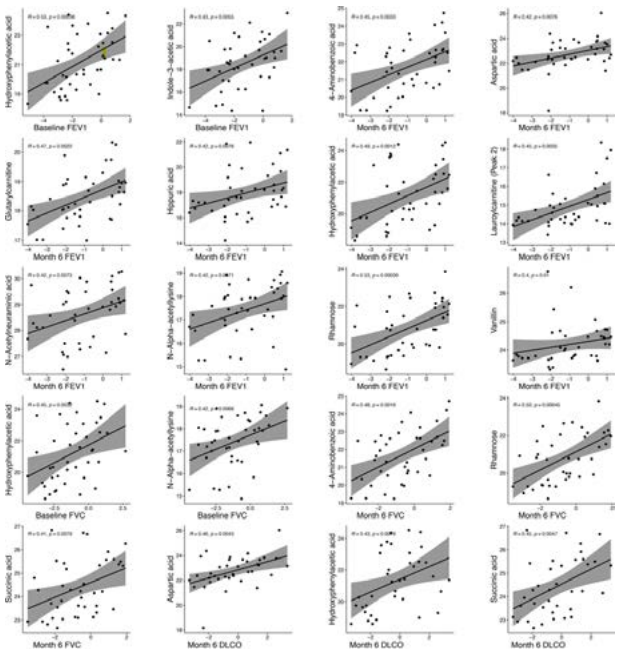
Introduction: Although post-TB lung disease (PTLD) is a major contributor to TB-associated morbidity, biological pathways that drive lung damage remain poorly characterized. We leveraged metabolomics of sputum to characterize pathways associated with lung health and disease during and after TB treatment.

Methods: We collected induced sputum from adults with and without HIV who were newly diagnosed with drug-susceptible pulmonary TB in Johannesburg, South Africa and enrolled in a longitudinal cohort study within 2 weeks of TB treatment initiation. Metabolomics was performed on sputum supernatants using hydrophilic interaction liquid chromatography coupled to an Orbitrap mass spectrometer. Pulmonary function testing was performed at baseline and 6 months (end of TB treatment). Spearman's correlation was calculated between metabolites and pulmonary variables (p-value < 0.05, FDR < 0.05).

Results: Among 40 participants, 7 (18%) were female, the median age was 37 (IQR 32-49), and 12 (30%) had HIV coinfection. At baseline, 22 (55%) had a reduced forced expiratory volume in 1 second (FEV1) and 16 (40%) had a reduced forced vital capacity (FVC) (z-score ≤ 1.65). Among 177 known metabolites, 16 were significantly positively correlated with lung function parameters (FEV1, FVC, or DLCO) at baseline or 6 months, including benzenoids (p-hydroxyphenylacetate [PHPA], p-aminobenzoate, hippuric acid, and vanillin), carnitines (lauroyl- and glutaryl-), amino acids (aspartic acid and N-alpha-acetyllysine), bile acids (GCDA and GCA), and lysolipids (LPC 16:0 and LPC 18:0), as well as rhamnose, N-acetylneuraminic acid, and succinate (Figure).



Conclusion: Among individuals with pulmonary TB, sputum metabolites reflecting a variety of pathways were correlated with lung function, both at diagnosis and after TB treatment completion. Robust associations of PHPA and lung function suggest a role for altered tyrosine metabolism in lung health. Future work will extend these analyses to a larger cohort, validating potential biomarkers of PTLD, with additional mechanistic analysis of key metabolic pathways.

TBS-EP41 Longitudinal immune cell profiling reveals distinct immunophenotypes associated with treatment response in pulmonary tuberculosis

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Inflammation is a hallmark of tuberculosis (TB), a leading cause of morbidity and mortality worldwide. While hyperinflammation can cause tissue damage, hypoinflammation may prevent effective pathogen clearance. Stratifying TB patients by immunophenotypes using flow-cytometry may guide future host-directed immunetherapies.

We conducted a two-step prospective observational cohort study among healthy controls and pulmonary TB patients in Germany to explore immune cell populations and their changes during treatment and their association with clinical data, cytokine assays and gene enrichment analysis.

At baseline (T0), individuals were grouped into three immune clusters. Cluster A, mainly healthy controls, showed a functional immune profile with less differentiated T cells and antigen-presenting cells (APCs) lacking exhaustion markers. Clusters B and C, primarily TB patients, displayed terminally differentiated T cells, PD-L1 on APC, and activated MAIT cells – which are indicative of an inflammatory and exhausted immune state.

After two weeks of therapy (T1), many patients transitioned towards cluster A, and by the end of therapy (Te), only two clusters remained, suggesting partial recovery of immune function.

Despite these shifts, markers such as CD27, CD28, and PD-L1 remained key in distinguishing clusters. Consistently, cluster C patients presented elevated levels of inflammatory cytokines (e.g., IFN, IP10, TNF, IL-6), IL-1RA, and soluble PD-L1, reflecting severe immune dysfunction. Gene expression analysis revealed increased T-cell differentiation and activation in dysfunctional clusters, alongside downregulated inflammation- and interferon-related genes. The end-of-treatment clusters showed differences in B-cell and platelet-related genes. Patients in clusters B and C had higher mycobacterial loads (shorter TTP) and slower clinical recovery (longer TTCC), especially those in cluster C.

TB patients showed variable changes in immune profiles during therapy. Severe immune dysfunction characterized by T-cell exhaustion and MAIT activation was linked to increased mycobacterial burden and delayed recovery, pointing towards biomarkers for guiding host-directed TB therapy.

TBS-EP44 Whole genome sequencing-guided patient management – A pragmatic clinical trial of a precision medicine strategy to shorten treatment for rifampicin-resistant tuberculosis

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Background: All patients with rifampicin-resistant tuberculosis (RR-TB) should have access to a short, safe and effective regimen. We evaluated a novel RR individualization strategy guided by whole genome sequencing (WGS) complemented with an AI-based treatment recommendation decision aid.

Methods: We conducted a randomized, pragmatic medical device trial in South Africa. Adult participants with pulmonary RR-TB, including those with fluoroquinolone resistance, were randomized to the South African 9- or 18-month regimen or a 6-month individualized WGS-guided regimen. Feasibility, acceptability, accuracy, treatment shortening, bacteriological effectiveness (change in half-life mycobacterial load and stable culture conversion at 8, 12 and 24 weeks), clinical effectiveness [risk difference (RD) for unfavourable treatment outcome with a 10% non-inferiority margin] and safety (severe adverse events) were evaluated.

Results: Of the 203 participants randomized, 162 were included in the mITT analysis (78 SOC and 84 WGS group) which consisted of culture positive participants. WGS results were accurate (99% specificity compared to phenotypic DST) and available for all participants in the WGS group. Overall, 81% of participants initiated the WGS-guided treatment after a median of 48 days (IQR 40,

62) following RR-TB treatment initiation. The WGS strategy resulted in treatment shortening of a median of 2.6 months. All surrogate markers of bacteriological response were in favor of the WGS strategy, but none of the differences were statistically significant. Unfavorable treatment outcomes were observed in 24% in the WGS group and 42% in the SOC group (RD -17.2% non-inferiority p <0.0001, superiority p=0.021) (figure). The proportion of patients experiencing a serious adverse event was similar in both groups (33% in SOC and 27% in WGS group, RD -6%, 95% CI -8, 20; p=0.41).

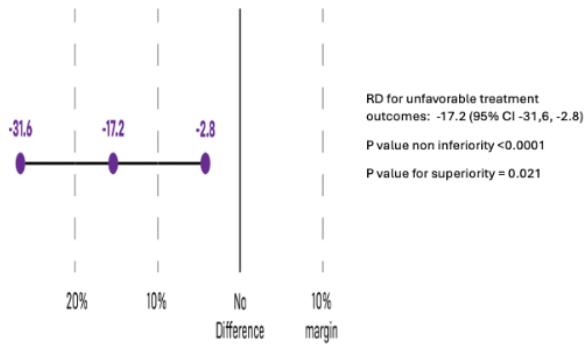

Figure. Clinical efficiency analysis shows non-inferiority (10 percentage point margin) and superiority of whole genome sequencing guided individualized treatment for rifampicin resistant TB in th modified intention-to-treat population.

Interpretation: The WGS-guided treatment strategy was feasible, acceptable, accurate, safe, demonstrated similar bacteriological efficacy and superior clinical effectiveness compared to the South African SOC strategy for RR-TB.

TBS-EP47 Design optimization for a global phase 3 trial of the M72/AS01$_{E-4}$ Mycobacterium tuberculosis (Mtb) vaccine

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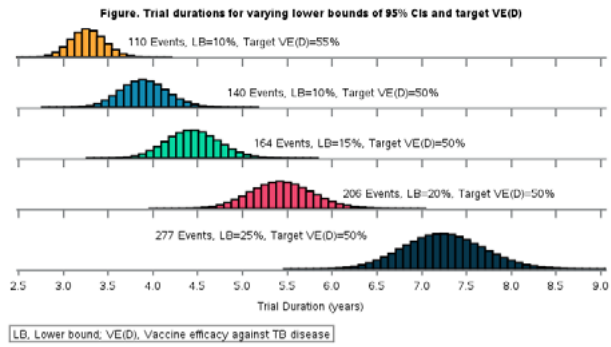
Background: Vaccine efficacy (VE) trials for tuberculosis (TB) are challenging in low incidence settings when timely evidence is needed. A phase 3 trial (NCT06062238) is underway to assess the VE of M72/AS01$_{E-4}$ against bacteriologically-confirmed pulmonary TB (VE[D]) among IGRA-positive/HIV-negative participants (primary objective) and in IGRA-negative and HIV-positive participants (secondary objectives).
Methods: Trial simulations were conducted for adults (15–44 years) in high-burden TB settings. Design features including trial duration, lower bound of 95% confidence interval (CI), and event count were modeled to assess feasibility under different VE assumptions based on phase 2b results (NCT01755598). Key assumptions included 3% annual IGRA conversion rate, 5% annual dropout, 2-year enrollment period, and pulmonary TB incidence of 200 to 500/100,000 person-years.
Results: Simulations revealed that in an all-comer population with 67% IGRA prevalence at enrollment, >90% of TB events would occur in baseline IGRA-positive participants, rendering the trial underpowered to evaluate VE(D) in IGRA-negative participants. A feasible trial design was determined to enroll 18,000 IGRA-positive, HIV-negative participants with 1:1 randomization of M72/AS01$_{E-4}$ or placebo.
Assuming pulmonary TB incidence rate of 400/100,000 person-years, a target VE(D) of 55%, power >90%, and a lower margin of 95% CI of 10%, this design would have a 90% probability of accruing 110 events in the per-protocol population and detecting a VE(D) of 55% within 4 years of enrollment initiation (Figure).
This timeframe will mitigate the impact of a lower-than-expected incidence rate and allow assessment of protection duration. The primary objective will be met if the null hypothesis H0: VE(D)≤10% is rejected, i.e., the lower bound of the 95% CI for VE(D) exceeds 10%.



Conclusions: Simulation-based trial design modeling informed the design of a feasible phase 3 TB vaccine trial. These findings underscore the value of rigorous trial simulations for optimizing trial designs, particularly for low-incidence disease contexts.

TBS-EP50 What is the potential impact of vaccinating younger (9–14 year old) adolescents with new TB vaccines?

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Background: New tuberculosis (TB) vaccines may be available soon. However, efficacy results will only be available for IGRA-positive individuals aged ~15+. In reality, countries may decide to introduce the vaccine routinely to adolescents younger than aged 15 with higher school attendance, e.g., alongside HPV vaccination. Most adolescents younger than aged 15 are IGRA-negative and have low TB incidence. We estimated the health impact of introducing new TB vaccines to 9–14 year olds in India and South Africa.
Methods: We used previously developed and calibrated TB infection transmission models to estimate the impact of introducing a vaccine with 50% efficacy to prevent disease in India and South Africa over 2030–50. We delivered the vaccine routinely to those aged 9 years and as one mass campaign for ages 10–14 years. The vaccine was assumed to be effective in either IGRA-positives only or irrespective of IGRA status.
Results: Modelling suggested that the health impact of vaccines effective only in IGRA-positive individuals was considerably smaller than for vaccines effective irrespective of IGRA status (India: 1.9 vs 6.1, South Africa: 0.2 vs 0.6, millions of averted TB episodes, respectively). The cost per disability adjusted life year (DALY) averted for vaccines effective only in IGRA-positives was larger than for vaccines effective irrespective of IGRA status (India: 412 vs 116, South Africa: 290 vs 75, USD per DALY averted).

Table Epidemiological and cost-effectiveness results with 95% uncertainty intervals

Country	The vaccine works in…	Cumulative TB cases averted	Cumulative TB deaths averted	Cumulative DALYs averted	Cumulative costs in USD	ICER (USD/DALY averted)
India	IGRA+ only	1.9m (1.6, 2.2)	0.3m (0.3, 0.4)	7.7m (6.8, 8.8)	3.2b (3.1, 3.3)	412 (358, 479)
	IGRA+ and IGRA-	6.1m (5.3, 6.9)	1.0m (0.9, 1.2)	22.5m (19.8, 25.8)	2.6b (2.5, 2.8)	116 (96, 135)
South Africa	IGRA+ only	0.2m (0.2, 0.2)	14.0k (10.9, 16.1)	0.6m (0.4, 0.6)	161m (102, 231)	290 (189, 456)
	IGRA+ and IGRA-	0.6m (0.6, 0.7)	41.1k (36.4, 48.3)	1.7m (1.5, 1.9)	129m (86, 187)	75 (51, 112)

Cumulative cases, deaths, and DALYs averted, and cumulative costs are measured between 2030–2050 and are compared to the scenario with no vaccine. Costs and ICERs (cost/DALY averted) are calculated from the health-system perspective. Abbreviations: b=billions, DALY=disability adjusted life-years, ICER = incremental cost-effectiveness ratio, k=thousands, m=millions, USD=United States dollars

Conclusions: If new TB vaccines only work in IGRA-positive individuals, and initial delivery is only to adolescents aged 9–14, impact is likely to be low, with much vaccine wastage.
Further, given the low TB incidence in this population, the lack of efficacy in IGRA-negative individuals would take many years to detect. We need to include younger adolescents in the development of new TB vaccines and plan to measure efficacy in this key group.

TBS-EP53 Immunometabolic profiling of *Mycobacterium tuberculosis* infected human lung tissue

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The early immune response to *Mycobacterium tuberculosis* (*Mtb*) infection is mediated by immune cells that work in synergy to phagocytose *Mtb* and illicit effector responses. *Mtb* activated macrophages mount a pro-inflammatory response and they rely on glycolysis and pentose phosphate pathway for metabolism. Immune cell metabolism is dictated by the available substrates in their microenvironment, and it can be rewired by *Mtb* for its survival. This reprogramming regulates the cell's effector functions that could contribute to tuberculosis (TB) disease progression.
Previously, we have shown that metabolic reprogramming and compromised mitochondrial function contribute to the breakdown of CD8+ T cell immunity during *Mtb* infection. In the present study, we hypothesise that metabolic reprogramming of host immunity in the lung by *Mtb* contributes to TB disease.
Notably, our carbon tracing studies with stable isotope-labeled substrates, combined with analysis of freshly resected human TB tissue, indicate that both the human tuberculous lung and *Mtb* infected monocyte-derived macrophages preferentially metabolize lactate over glucose.
We also found that the use of lactate as a substrate reduced the secretion of IL-1β, IL-6, IL-12, TNF-α, IFN-γ, IL-4 by *Mtb* infected human monocyte-derived macrophages. Immunohistochemical analysis of the human tuberculous lung revealed the differential production of GLUT 2, 3, 4 and 5, in addition to monocarboxylate transporters, MCT1 and 4, which transport lactate, across the spectrum of lesions. Lactate dehydrogenase B that preferentially catalyses the conversion of lactate into pyruvate was also differentially produced across the spectrum of lesions.
Currently, we are employing multiplex immunofluorescence (mIF; Lunaphore platform) to allow a better understanding of the complex interaction between immune

cells, bacilli, and metabolism in the tuberculous lung. These findings lay the foundation for future studies that will explore the potential of immunometabolic markers as biomarkers of TB disease progression and potentially leading to host directed therapeutic strategies.

TBS-EP56 Investigation into the peripheral localization, morphology and host/pathogen interaction of MDSCs during stages human tuberculosis lymph nodes granuloma evolution

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Tuberculosis (TB) granulomas exist along a spectrum of phenotypes, ranging from protective, sterile granulomas that contain the infection to permissive granulomas that allow uncontrolled growth and dissemination of Mycobacterium tuberculosis (M.tb). These heterogeneous granulomas can coexist within a single host, with TB clinical and treatment outcomes determined locally by the cumulative effect of this granuloma heterogeneity.
However, the factors driving the formation and persistence of distinct granuloma phenotypes remain largely unclear. Myeloid suppressor cells (MDSCs), known for their immunosuppressive and immunomodulatory roles, were hypothesized in this study to play a major role in granuloma heterogeneity.
To test this hypothesis, the study employed the 10x Genomics Visium spatial transcriptomics platform, combined with routine histological staining, to characterize the immune landscape of four granulomas (necrotic and non-necrotic) across eight tissue sections from archived lymph nodes of children who underwent excision surgery for lymphadenitis.
Findings from this study indicate that pediatric lymph node granulomas exhibit compartment-specific structures distinct from those observed in pulmonary granulomas.
Notably, they lack the characteristic lymphocytic cuffs and B-cell islands commonly seen in pulmonary granulomas.
Additionally, MDSCs in the granulomas were found to colocalize more with M2 macrophages and neutrophils, rather than T cells, suggesting that these interactions likely support granuloma polarization and promote immunosuppression in both necrotic and non-necrotic granulomas.
Widespread immunosuppression characterized by TGFB1 and IDO expression was observed in all granulomas. However, in certain microenvironments, the presence of pro-inflammatory cytokines such as IFN-Y counteracted these suppressive signals, creating protective microenvironments. Both protective and suppressive microenvironments were present in varying proportions across all granulomas, with the dominant microenvironment determining the overall phenotype of each granuloma. These findings suggest the presence of distinct, spatially coordinated immunoregulatory programs within different TB granuloma types during active disease.

TBS-EP59 Improving collaboration through access: A scoping review of TB clinical trial repositories

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Background: Better biomarkers for treatment response could help in making trials faster, less costly and more meaningful; and allow individualised treatment on a programmatic level. Validation of new biomarkers is hampered by access to sufficient numbers of patients with relapse; a usually rare outcome in trials.
To address this, as part of the Facilitating Accelerated Science and Translation for TB Regimen Development (FAST-TB) consortium, we undertook a scoping project to identify biobanks and data repositories that hold clinical trial data and biobanked samples, and to assess the extent to which these resources are available for potential secondary use.
Methods: We developed and distributed electronically a structured questionnaire targeting TB clinical trial repositories throughout the globe. The survey aimed to characterize repository contents, metadata, access frameworks, and openness to further engagement.
Results: Of the 23 organisations contacted we received 9 responses, describing data from 33 studies, including >23,500 patients from Asia, Africa and Europe. Of these, 4 organisations reported data and/or samples from persons who experienced disease recurrence. A total of 13 studies were observational, primarily in adults (22/33) and focused on pulmonary TB (15/33). Samples and data types were varied (Figure 1).

Notably, repository representatives showed strong interest in follow-up discussions on data access and sample specifications. FAST-TB will be able to establish contact between biobanks and researchers upon request.

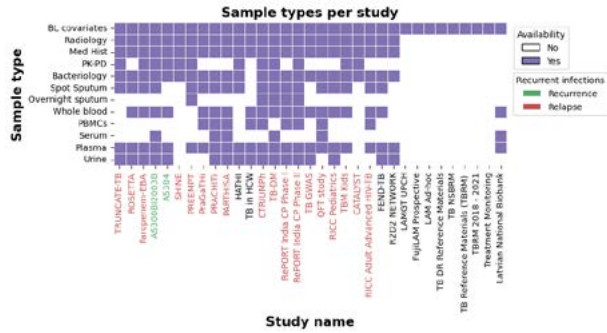

Figure 1. Sample availability by study. Red: recurrence samples; green: relapse samples identified by sequencing.

Conclusion: This openness presents a key opportunity: by systematically mapping available resources and engaging stakeholders, FAST-TB aims to facilitate new research collaborations and improve the efficiency of treatment development and evaluation pipelines.

While preliminary, this effort aims to improve the visibility and utility of existing clinical trial assets, thereby supporting broader efforts to accelerate the development, evaluation, and implementation of novel TB treatment biomarkers.

TBS-EP62 Phosphatidylcholine alterations correlate with natural and M. tuberculosis-specific antibody responses in a primate model

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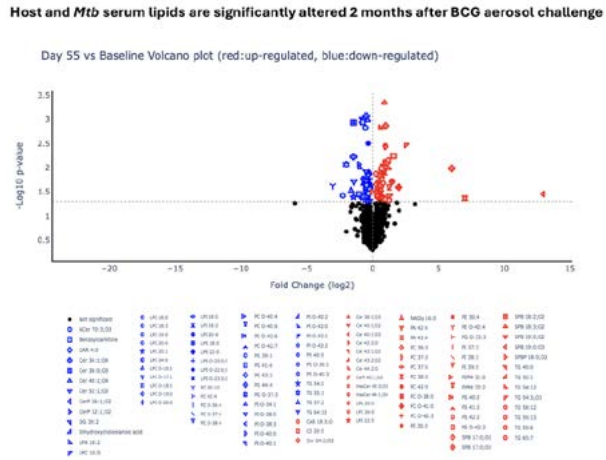
Background: *Mycobacterium tuberculosis* (Mtb) manipulates host lipid metabolism to support its survival and immune evasion. Phosphatidylcholine (PC), a key membrane phospholipid, is elevated in tuberculosis (TB) patients and promotes Mtb growth in macrophages, while its precursor lipids, lysophosphatidylcholines (LPCs), are decreased. Natural antibodies, such as anti-P1 and anti-Apolipoprotein B100 immune complex (anti-ApoB100 IC) antibodies, recognize various phospholipids including phosphatidylcholine and can inhibit their uptake by macrophages. This study explores the relationship between PC metabolism and both Mtb-specific and natural antibody responses in a non-human primate model of TB.

Methods: Longitudinal serum samples from Rhesus macaques exposed to aerosolized Bacillus Calmette-Guérin (BCG) were collected at Days 0, 36, and 55 post-challenge. ELISAs quantified IgA and IgM responses to Mtb-specific antigens (lipoarabinomannan [LAM], mycolic acid) and IgA and IgM natural antibody responses (anti-P1, anti-ApoB100 IC). Lipidomics profiled changes in host and bacterial lipids. Data were analyzed using Mann-Whitney U tests, ANOVA, and Spearman correlation.

Results: Serum levels of PC derivatives (e.g., PC42:0, PC48:2, PC-O 41:0, PC-O 42:3) significantly increased, while LPCs (e.g., LPC16:0, LPC20:1, LPC24:0) significantly decreased at Days 36 and 55 ($p < 0.05$). IgA responses to LAM and ApoB100 IC showed strong correlations with PC species such as PC42:2 (R = 0.61, R=0.67) and PC-O 33:3 (R = 0.57, R=0.69; $p < 0.01$), respectively. Anti-LAM IgM and anti-P1 IgA responses correlated with an Mtb cell wall phospholipid, phosphatidylinositol mannoside 4 33:2 (R = 0.56, R=0.59; $p < 0.015$).



Conclusions: BCG exposure induced sustained changes in lipid metabolism, including PC elevation and LPC depletion, mirroring patterns seen in human TB. Specific PC derivatives correlated with both Mtb-specific and natural antibodies, particularly of IgA and IgM isotypes. These results suggest a link between host lipid remodeling and immune responses, with potential cross-reactivity between altered host lipids, Mtb antigens and natural antibodies.

TBS-EP65 Baseline Sputum Gene Expression and Its Association with Pulmonary Fibrosis and Post-TB Lung Function

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Post-tuberculosis lung disease (PTLD) is an important contributor to morbidity and mortality following tuberculosis (TB), yet its underlying mechanisms are poorly understood. Lung structural involvement and impaired pulmonary function at presentation are associated with PTLD, but biomarkers of these conditions are lacking. We hypothesized that sputum gene expression would be associated with radiographic and functional measures of respiratory severity at baseline and after treatment completion.

Adults (≥18 years) in South Africa with Xpert-positive pulmonary TB (n=63) provided sputum samples within 2 weeks of treatment initiation. Sputum cell pellets were profiled using a 96-gene custom Fluidigm panel, with RT-qPCR data normalized to ACTB. Fibrosis and consolidation were scored on high-resolution computed tomography using a 0–5 scale, and lung function was assessed by spirometry (FEV_1 and FVC z-scores). Linear regression models adjusted for age, sex, and HIV status (HIV only for lung function given z-score use) using a false discovery rate < 0.2.

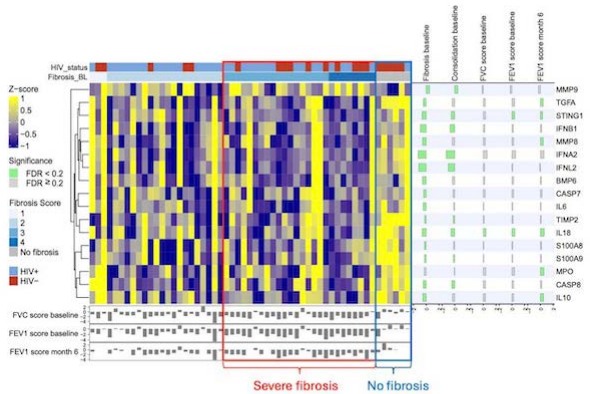

Figure. Baseline sputum gene expression stratified by pulmonary fibrosis severity. Heatmap of normalized gene expression (−ΔCt) in baseline sputum samples from adults with pulmonary TB, shown across fibrosis scores (0–4) on high-resolution CT. A marked contrast in gene expression was observed between participants with no fibrosis (score 0) and those with severe fibrosis (scores 3–4). Individuals without fibrosis—mostly people without HIV and with better lung function at baseline and 6 months—exhibited higher expression of *BMP6, CASP7, CASP8, IFNA2, IFNB1, IFNL2, IL10, IL18, IL6, S100A8, S100A9, STING1, TGFA,* and *TIMP2,* while *MMP9* expression was elevated in severe fibrosis. These patterns reflect distinct transcriptional profiles associated with fibrosis severity at TB treatment initiation.

Higher baseline expression of BMP6, CASP7/8, IFNA2, IFNB1, IFNL2, IL10, IL18, IL6, S100A8/9, STING1, TGFA, and TIMP2 was associated with less baseline pulmonary fibrosis, while higher MMP9 expression was associated with greater fibrosis. Greater expression of IL18 and STING1 were associated with higher FEV_1 at baseline and 6 months; IL18 was also associated with higher FVC at baseline. Several immune mediators previously associated with baseline fibrosis (TGFA, IL10) were also associated with higher 6-month FEV_1.

Our preliminary findings suggest that upregulation of immune mediators—some with anti-fibrotic properties—may lower risk of fibrotic progression. IL18, interferons, and BMP6 may suppress TGF-β signaling, while STING1, IL10, and TGFA may exert immune regulation and epithelial repair. IL18 showed consistent protective associations across all outcomes, highlighting its potential as a biomarker and possible therapeutic target in PTLD. These encouraging pilot data warrant further validation.

TBS-EP68 Use of tuberculosis molecular bacterial load assay in sputum samples to characterize tuberculosis treatment response over 12 weeks

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Introduction: Tuberculosis Molecular Bacterial Load Assay (TB-MBLA, LifeArc) quantifies viable *Mycobacterium tuberculosis* (Mtb) RNA and offers a faster readout of treatment response than Mycobacterial Growth Indicator Tube time-to-positivity (MGIT-TTP). We characterized treatment response in the SUDOCU and DECODE studies using longitudinal TB-MBLA data and compared it with MGIT-TTP, a gold standard.

Method: Sputum samples collected weekly over 12 weeks from 148 adults with drug-sensitive pulmonary TB. Participants were randomized to sutezolid- or delpazolid-containing regimens (with background bedaquiline, delamanid, and moxifloxacin) or control, were utilized. Batch-specific standard curves converted quantification cycle values (Cq) to copies-per-reaction (c/rxn). Both TB-MBLA and MGIT-TTP values were $\log_{10}$-transformed.

Result: We analyzed 4,864 TB-MBLA measurements of Mtb 16S rRNA (Figure 1). Log_{10} TB-MBLA showed a moderate negative correlation with $\log_{10}$ MGIT-TTP (Pearson's r = –0.59, 95% CI: –0.64 to –0.54). At week 6,

30.6% of TB-MBLA observations were below the limit of detection (LOD of 2.11 $\log_{10}$ c/rxn) compared with 39.5% of MGIT-TTP that had reached the upper LOD (1008 h). By week 12, these proportions increased to 68.8% for TB-MBLA and 95.2% for MGIT-TTP. While MGIT-TTP reaches the LOD earlier and shows a larger proportion of undetectable observations later in the treatment period, TB-MBLA provides a more continuous and quantitative measure of bacterial load and treatment response. Correlations between baseline biomarker values and time to sputum culture conversion (TSCC) were r = 0.24 (95% CI: 0.13 to 0.34) for $\log_{10}$ TB-MBLA, and r = –0.21 (95% CI: –0.32 to –0.10) for $\log_{10}$ TTP, showing similar strengths.

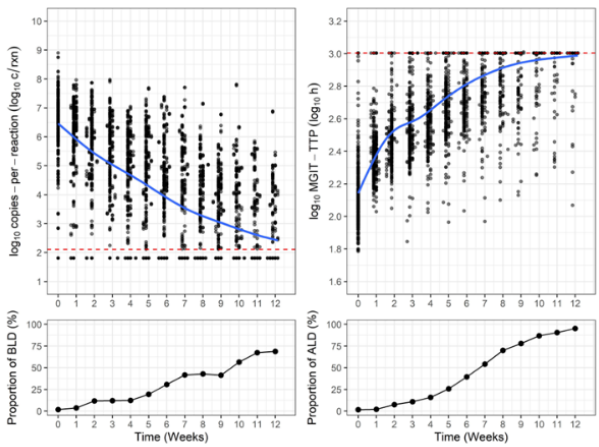

Figure 1: Observed $\log_{10}$ copies-per-reaction ($\log_{10}$ c/rxn) from Tuberculosis Molecular Bacterial Load Assay (TB-MBLA, LifeArc) (top-left panel) and observed $\log_{10}$ MGIT-TTP ($\log_{10}$ h) (top-right panel) over time during treatment. The top panels show individual observations as dots, with blue solid lines representing locally estimated scatterplot smoothing (LOESS) regression. The red dashed line indicates the limit of detection (LOD). The bottom-left panel displays the proportion of $\log_{10}$ c/rxn observations below the LOD (BLD), while the bottom-right panel shows the proportion of $\log_{10}$ TTP observations above the LOD (ALD).

Conclusion: TB-MBLA aligns with MGIT-TTP while shortening analytical turnaround times, underscoring its utility for monitoring TB treatment response. Ongoing work using non-linear mixed-effects models will further investigate the dynamics of TB-MBLA, the link to MGIT-TTP and clinical outcomes and evaluate performance in drug-exposure-response analysis to support dose optimization.

TBS-EP71 *Mycobacterium tuberculosis* curli pili reduces oxygen consumption rate of THP-1 macrophages during early infection

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Background: The development of improved anti-tuberculosis (TB) strategies to address drug-resistance and ineffectual TB treatment regimens should focus on interrupting the initial host-pathogen interaction.
This study aimed to elucidate the effect of surface-located adhesin, *Mycobacterium tuberculosis* (*Mtb*) curli pili (MTP), on the bioenergetic and metabolomic profiles of THP-1 macrophages during initial stages of infection.
Methodology: Differentiated THP-1 macrophages were infected for 4 hours with wildtype (WT), Δ*mtp*, or *mtp*-complement strains of *Mtb*. Bioenergetic profiles and metabolic flux were determined through cell mitochondrial stress test (CMST) and glycolytic rate assay (GRA) performed in an extracellular flux analyzer. The metabolic flux of uninfected and *Mtb* infected THP-1 macrophages were determined through $^{13}C_6$-glucose tracing liquid chromatography with tandem mass spectrometry. Statistical analysis highlighted differences/similarities amongst the THP-1 macrophage groups.
Results: The Δ*mtp* infected THP-1 macrophages mimicked the higher oxygen consumption rate (OCR) for basal respiration, ATP production, maximal respiration and spare respiratory capacity of the uninfected THP-1 macrophages, relative to the WT and *mtp*-complement infected THP-1 macrophages. The Δ*mtp* infected THP-1 macrophages displayed the highest compensatory glycolytic rate. *Mtb* infection caused the redirection of carbon from the tricarboxylic acid cycle to glycolysis, in addition to an increased flux through the pentose phosphate pathway. However, in the Δ*mtp* infected THP-1 macrophages, the total metabolite abundance was lower, similar to the uninfected THP-1 macrophages.
Conclusion: Data indicates that the absence of MTP facilitates prompt clearance of the intracellular pathogen before it establishes a successful infection. This implies that the presence of MTP facilitates the survival of the pathogen during the early stages until infection is established.
These findings support the growing evidence that the MTP adhesin is an important virulence factor and interruption of the interaction between pathogen and host, will facilitate swift clearance of the infection by the host.

TBS-EP74 Non-sputum biomarkers for on-treatment prediction of TB disease recurrence

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Introduction: TB disease recurrence represents a significant burden to persons on treatment and incurs long follow-up periods in clinical trials. On-treatment identification of individuals at greater risk of recurrence could guide alternative treatment and follow-up strategies.
Methods: From the PanACEA multi-arm, multi-stage trial, we identified 8 persons who experienced disease recurrence within 1 year of treatment initiation, and 8 controls with sustained cure, matched for biological sex, age, treatment arm, and baseline disease severity. We generated bulk RNA-sequencing from whole blood samples at weeks 0,1,2,4,9,14, and 26, and paired with clinical covariate data. We performed cross-sectional univariate analysis using t-tests and Kruskal-Wallis tests, and used linear mixed models and repeated measures correlation for longitudinal data, with Bonferroni correction. Model selection was performed with likelihood ratio tests (LRT). We validated the predictive performance of multiple transcriptomic signature scores using area under the receiver operating characteristic curve (AUROC) values.

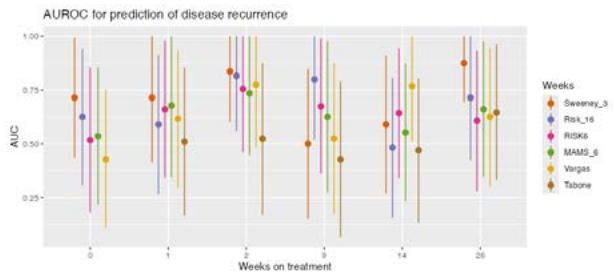

Figure 1. AUROC curves of transcriptomic signature scores across treatment weeks.

Results: Median time-to-negativity was significantly different between recurrence vs controls (adjusted P = 2.0 x 10-2). Longitudinally, we also found significantly different temporal changes in body mass index (BMI) (adjusted P=3.82 x10-4) and heart rate (adjusted P=6.71x10-5) between outcome groups. Sweeney-3, Risk-6, MAMS6 and Tabone27 signatures were correlated with BMI over time, and MAMS6 and Risk-16 with neutrophil counts. At week 26, Sweeney-3 showed highest performance [AUROC = 0.87 (0.68-1 CI); Figure 1]. Interestingly, for 4 signatures, the highest AUC values were observed at Week 2 into treatment.
Conclusions: The Sweeney-3 signature shows promise for treatment outcome prediction at week 26. Temporal biomarkers may be more informative than cross-sectional observations for treatment monitoring, and HR and BMI could represent informative and easily measurable markers of treatment response. Ongoing work is focused on integrative modeling combining transcriptomic and clinical features to optimize early risk stratification.

TBS-EP77 On the replacement of smear microscopy: Decontamination has a negative impact on GeneXpert Ultra

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Background: WHO recommends replacing smear microscopy (SM) with molecular tests, such as GeneXpert MTB/RIF Ultra (GX), for detection of Mtb in pulmonary tuberculosis (PTB). GX is used both on decontaminated samples in TB laboratories and directly on sputum as a point-of-care test (POCT). A direct comparison between these strategies in relation to SM is needed before GX can replace SM for the evaluation of contagiousness.
Method: For direct comparison on identical samples, pooled Mtb-negative sputum samples were spiked with Mtb H37Rv at 2500 CFU/ml and 250 000 CFU/ml and analysed directly (POCT) and after NaOH-based decontamination and concentration of the sample. Baseline Cycle threshold (Ct) value of IS6110 and semi-quantiative result from the first POCT clinical sputum sample were compared to highest SM (auramine stained after concentration) from culture confirmed PTB patients in Sweden.
Results: In spiked sputum samples, median Ct-values were significantly lower in POCT sputum samples (20.8 (IQR 17.9-22.9) vs 23.2 (IQR 22.4-25.3), p<0.05, n=22) at 2 500 CFU/mL (Figure 1A). The median POCT Ct-value was significantly higher in SM negative patients (19.8 (IQR 16.8-24.4) vs 16.2 (IQR 16.1-17.4), p<0.001, n=44) and decreased with higher SM grade (rho=-0.57, p<0.001). All GX negative patients were SM negative and 94% (30/32) of SM positive patients had a semi-quantitative GX result of Low or higher (Fig 1B). Both POCT Ct-value and SM grade correlated significantly to time to positive culture (TTP) (rho=0.77 and 0.72, p<0.001).

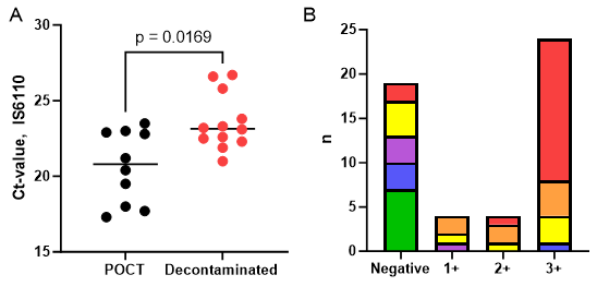

Figure 1A: GeneXpert MTB/RIF Ultra performed on pooled Mtb-negative sputum samples spiked with Mtb H37Rv at 2 500 CFU/ml analysed with (red dots) and without prior decontamination (POCT, black dots), n=22. No statistical difference was seen at 250 000 CFU/ml (data not shown). **1B**: Semiquantiative GX result of the first clinical sputum sample analyzed with POCT (n=51) and highest smear grade. Trace outlier in 3+ category had a second POCT with "Low" result. Negative=Green, Trace=Blue, Very Low=Purple, Low=Yellow, Medium=Orange, High=Red.

Conclusions: Sputum samples analysed directly by GX (POCT) showed a higher bacterial yield than decontaminated samples. In clinical sputum samples from culture confirmed PTB patients, there was a strong correlation between POCT and SM as well as to TTP. Our results suggests that GX performed directly on the sputum sample, rather than after decontamination, may replace SM both for diagnosis and evaluation of contagiousness.

TBS-EP80 Persistent immune alterations following TB treatment: Longitudinal profiling and possible association with microbiota

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Background: *Mycobacterium tuberculosis (M.tb)* infection drives systemic immune activation. However, immune perturbations and their resolution following tuberculosis (TB) treatment remain unclear. We hypothesise that *M.tb* induced inflammation persists post treatment with possible microbial modulation, affecting disease severity, treatment outcomes, and immune recovery.
Methods: We profiled serum inflammatory markers using Luminex assays paired with stool and sputum microbiome (16S rRNA gene sequencing analysis) in people with TB and their household contacts (HHCs) at baseline, 6 months (end of treatment) and 18 months post treatment. Associations between immune markers and microbial composition were examined over time to identify potential drivers of immune activation or suppression.
Results: Systemic inflammatory markers were elevated and heterogenous in people with TB compared to lower and more uniform inflammatory marker expression in HHCs. Longitudinally, elevated inflammatory markers declined with treatment but remained altered post-treatment. Distinct immune correlations and trajectories suggest dynamic immune remodelling. Post-treatment, distinct microbial communities emerged in both the lungs and gut. Preliminary findings suggest links between specific microbes and immune profiles.
Conclusion: Our findings highlight TB associated heightened and variable immune activation that partially resolves post-treatment, potentially contributing to post-TB complications. Anaerobe-driven inflammation may underlie these effects, highlighting the importance of host-microbiome interactions in TB susceptibility, recovery and targets for host-directed therapy.

TBS-EP83 Blood RNA biomarkers to predict treatment failure or relapse after truncated treatment of pulmonary tuberculosis

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Background: Biomarkers indicating cure at end of treatment could optimise implementation of shorter treatment strategies. We assessed candidate blood RNA biomarkers to predict treatment failure or relapse (TFR) following 8 weeks' treatment in the TRUNCATE-TB trial.
Methods: TRUNCATE-TB randomised adults (18–65 years) with rifampicin-susceptible pulmonary TB (NCT03474198) to either 24-week standard treatment; or to the TRUNCATE strategy, comprising initial 8-week treatment with re-treatment where needed. We performed blood RNA sequencing of samples from baseline, weeks 4/8, end of treatment (if treatment was extended), and week 24. We evaluated the accuracy of 12 candidate RNA biomarkers (from systematic review) for 96-week TFR.
Results: RNA data were available from 166 standard treatment and 446 TRUNCATE strategy participants (median 4 samples per participant). TRUNCATE strategy participants included 80 experiencing TFR and 309 without TFR. Candidate RNA biomarkers were highly correlated (Spearman ρ 0.76-0.98). FCGR1A showed the highest mean area under the receiver operating characteristic curve (AUROC) for TFR across sampling timepoints. Biomarker scores were highest at baseline. These resolved over time with similar trajectory by treatment strategy (Figure), but median scores remained >2 standard deviations above the mean of a healthy control population after 8 weeks' treatment. Biomarker scores continued to decline after treatment cessation in TRUNCATE strategy participants. Discrimination of FCGR1A

for TFR among TRUNCATE strategy participants was moderate from baseline to end of treatment (AUROCs 0.65-0.67); but improved at week 24 (AUROC 0.71; 95% CI 0.65-0.78).

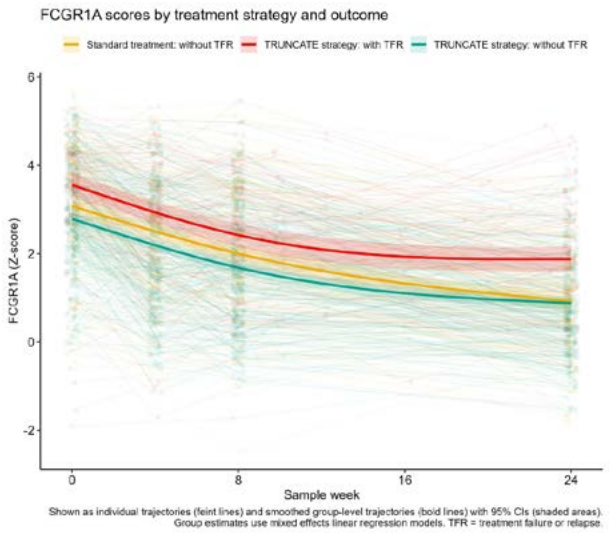

Figure.

Conclusions: Residual elevation of RNA biomarkers at 8-weeks and similar trajectories among those receiving truncated or standard treatment suggests ongoing bacterial clearance or gradual immune homeostasis after 8 weeks. Among TRUNCATE strategy participants, RNA biomarkers provide limited prediction of long-term TFR when measured at baseline through treatment end. Divergent biomarker trajectories thereafter suggests a potential role in predicting TFR after treatment cessation.

TBS-EP86 Proposing a framework for human dose prediction of anti-tuberculosis drug candidates

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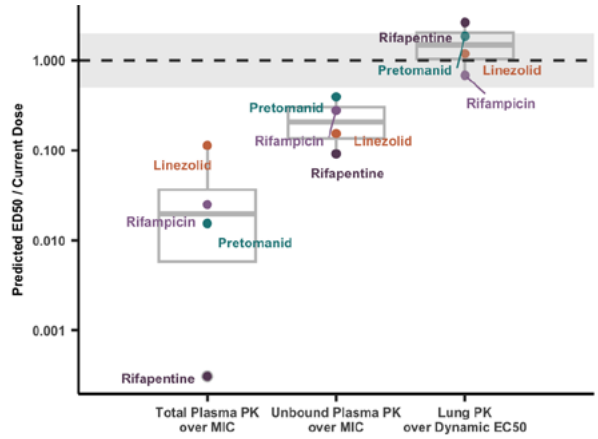
Background: Having a standardized approach for human dose prediction (HDP) early in discovery and development is transformative for increasing the likelihood of a compound's success. In the tuberculosis (TB) field, plasma exposure over the minimum inhibitory concentration (MIC) has been used as a pharmacokinetic-pharmacodynamic (PK-PD) target to inform efficacious dose, but this has not aligned with clinical results. By performing a back-translational PK-PD analysis of approved anti-TB drugs, we aim to identify best methods for HDP.
Methods: Potency assay data, as well as translational and clinical PK models, were collected for ten anti-TB drugs, including four that underwent clinical dose-finding studies. Exposures in various matrices (plasma, lung, lesions, cavitary caseum) based on a rabbit-to-human translational tool were simulated across doses up to 10000 mg using NONMEM. Coverage over relevant PD targets, including MIC, intramacrophage IC_{90}, caseum MBC_{90}, and *in vivo* EC_{50}, was simulated and an effective dose quantified, defined as achieving coverage over 50% of the steady-state dosing interval (ED_{50}). This ED_{50} was then compared to the currently known efficacious dose of each drug.
Results: Generally, plasma PK over MIC underpredicted the clinical efficacious dose across drugs, even after protein binding corrections. Lung PK over EC_{50}, a dynamic metric quantified from *in vivo* PK-PD studies, resulted in predictions within approximately two-fold of efficacious dose for clinically dose-optimized drugs. Assessing caseum PK-PD is essential for identifying efficacy in hard-to-treat patient phenotypes and could accurately identify penetrating drugs.



Conclusions: Efficacious dose prediction relies on the attainment of an accurate PK-PD target. Coverage defined by site-of-disease exposures over a dynamic potency target has been shown to be most predictive of clinical efficacious dose. This approach has the potential to reduce the time needed for a drug to reach clinical stages with an acceptable dose range and minimize costly dose-finding studies.

TBS-EP89 Evaluating the association between baseline neutrophil counts and pulmonary tuberculosis outcomes: Baseline and post-treatment lung function and high-resolution CT findings

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Background: Nearly two-thirds of pulmonary tuberculosis (TB) patients have respiratory sequelae after treatment. Neutrophils are associated with TB pathology, but the relevance to post-TB lung disease is unknown. We hypothesized that higher baseline blood neutrophil counts would be associated with worse lung function and imaging in adults even after treatment for pulmonary TB.
Design/Methods: We conducted a longitudinal cohort study of 259 TB patients initiating standard four-drug therapy for rifampin-susceptible pulmonary TB in Johannesburg, South Africa.
We used Wilcoxon rank-sum testing to compare neutrophil groups with respect to forced expiratory volume in 1 second (FEV_1), forced vital capacity (FVC), total lung capacity (TLC), and diffusing capacity of the lung for carbon monoxide (DLCO), and high-resolution CT (HRCT) scores for lung abnormality, consolidation and fibrosis. These were assessed at baseline (within 2 weeks of treatment), month 6 (end of treatment), and month 12. Race-neutral Global Lung Initiative reference standards measured lung function, which adjust for age, gender, and height. Linear regression adjusted for HIV, antiretroviral therapy, smoking and alcohol.
Results: Table 1 shows that participants in the baseline top neutrophil tertile cohort had lower baseline FEV_1, FVC, and DLCO z-scores ($p<0.05$), indicating worse lung function and gas exchange, and more consolidation and fibrosis on HRCT ($p<0.05$). Imaging differences persisted at 12 months ($p<0.05$), but lung function differences did not.

Table 1. Comparison of Lung Function and High-Resolution CT (HRCT) Imaging by Neutrophil Tertiles at Initiation and Post-Tuberculosis Treatment

Baseline (first two weeks of TB Treatment)					Month 12 (6 months after TB Treatment)				
Lung Characteristics	Top 33% Neutrophils (N=85)	Bottom 67% Neutrophils (N=171)	P-value	Adjusted P-value	Lung Characteristics	Top 33% Neutrophils (N=85)	Bottom 67% Neutrophils (N=171)	P-value	Adjusted P-value
FEV1 z-score median (IQR) N=248	-1.9 (-2.8, -1.0)	-1.2 (-2.3, -0.3)	**0.002**	**0.027**	FEV1 z-score median (IQR) N=86	-1.1 (-2.4, -0.4)	-0.9 (-1.9, 0.3)	0.246	0.114
FVC z-score median (IQR) N=248	-1.7 (-2.6, -0.6)	-1.2 (-1.9, -0.3)	**0.005**	**0.049**	FVC Z-score median (IQR) N=86	-0.7 (-1.7, 0.1)	-0.4 (-1.4, 0.4)	0.274	0.239
TLC z-score median (IQR) N=127	-1.3 (-2.7, -0.3)	-1.2 (-2.2, -0.0)	0.462	0.757	TLC Z-score median (IQR) N=60	0.1 (-0.4, 0.6)	-0.4 (-1.5, 0.4)	0.186	0.558
DLCO z-score median (IQR) N=205	-1.0 (-2.1, 0.4)	0.5 (-1.7, 0.6)	0.126	**0.047**	DLCO Z-score median (IQR) N=85	-0.1 (-1.9, 1.5)	-0.1 (-1.2, 1.0)	0.882	0.593
Overall HRCT lung abnormality median (IQR) N=206	14.0 (11.0, 19.0)	14.0 (9.0, 17.0)	0.281	0.273	Overall HRCT lung abnormality median (IQR) N=113	9.5 (5.0, 14.0)	7.0 (5.0, 10.0)	0.070	0.139
HRCT Consolidation median (IQR) N=206	6.0 (4.0, 10.0)	4.0 (2.0, 7.0)	**<0.001**	**<0.001**	HRCT Consolidation median (IQR) N=113	0.0 (0.0, 0.0)	0.0 (0.0, 0.0)	0.173	**0.043**
HRCT Fibrosis median (IQR) N=206	7.0 (4.0, 12.0)	5.0 (3.0, 9.0)	**0.001**	**0.002**	HRCT Fibrosis median (IQR) N=113	6.0 (3.0, 11.0)	4.0 (2.0, 7.0)	**0.031**	**0.028**

Table 1. Lung function z-scores and High-Resolution CT (HRCT) scores at baseline (within 2 weeks of TB treatment) and 6 months after TB treatment. P-values show statistical significance using the Wilcoxon rank-sum test. If not already accounted for in the z-score (which adjusts for age, sex, and height, and is race-neutral), adjustments were made for HIV, antiretroviral therapy, smoking, and alcohol with linear regression.

Conclusions: The baseline top neutrophil tertile cohort had significantly worse baseline lung obstruction, impaired gas exchange, and greater consolidation and fibrosis. At month 12, significant differences in consolidation and fibrosis persisted, while lung function differences were attenuated. Baseline neutrophils can be an important marker for persistent lung damage.

TBS-EP92 Features of lesions on PET-CT predict progression from subclinical TB to symptomatic TB disease, but interferon gamma release assays do not

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Background: Understanding the progression or resolution of early and subclinical TB lesions are challenging due to lack of reference tests. Interferon gamma release assays (IGRAs) are considered the investigation of choice for latent tuberculosis (TB) infection. However, little is known about IGRA in subclinical TB, and there is no validated classification system for subclinical TB lesions.
We investigated the association between IGRA status after TB exposure, characteristics of subclinical TB lesions on FDG PET-CT, and progression to clinical TB disease, in South Africa, one of the WHO high TB burden countries.
Methods: A prospective cohort study was conducted from July 2020 - July 2024. We recruited adult household contacts of people recently diagnosed with pulmonary TB, and people from the same community with no known exposure (controls). Those with HIV or prior TB were excluded. Active TB was excluded with symptom screen, sputum MGIT culture, Xpert Ultra, and Chest X-ray. All participants had IGRA, and a subset had FDG PET-CT. Participants were followed up for a minimum of 12 months.
Results: Most participants were IGRA positive irrespective of TB exposure: 249/308 (80.8%) contacts; 103/143 (72.0%) controls. 64/282 (22.7%) were PET-CT positive for subclinical TB: 52 (27.2%) contacts ($p=0.003$); 12 (13.2%) controls. Nine (3.2%) participants progressed to symptomatic pulmonary TB over a median of 12 months (range 3-38); 8 were originally PET-CT positive

(p<0.001). IGRA status did not predict subclinical TB on PET-CT or progression to symptomatic pulmonary TB; nor did the unstimulated (nil) or the TB-antigen stimulated interferon gamma levels. Multiple-nodular patterns on CT and high FDG avidity on PET were most strongly associated with progression to clinical TB.
Conclusion: The prevalence of PET-CT-defined subclinical TB was high in community members and TB contacts and predicted progression to active TB disease, but IGRAs failed at both outcomes.

TBS-EP95 The expansion of an immune-evasive Mycobacterium tuberculosis subclade of lineage 2 in Lima, Peru

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Household-based studies of tuberculosis transmission often use tuberculin skin test (TST) conversion among contacts to infer transmissibility. However, whether these household-level metrics truly reflect broader population dynamics remains unclear.
To investigate this, we conducted two prospective cohort studies in Lima, Peru with 10 years apart (2009–2012 and 2020–2022). In the earlier cohort, we enrolled 4,044 individuals with pulmonary TB and 14,044 of their household contacts (HHCs), following the latter for one year to assess incident TB infection via TST conversion. The later cohort enrolled 2,000 TB patients.
Whole-genome sequencing was performed on 3,567 isolates from the first cohort and 1,765 from the second. We focused on a specific subclade of Mycobacterium tuberculosis Lineage2 (exp-L2), assessing its transmissibility relative to other L2 strains (non-exp-L2) using two indicators:
1. The risk of TST conversion among exposed HHCs in the first cohort;
2. Changes in its population prevalence in over 10 years.
Among 222 initially TST-negative HHCs exposed to L2 strains, those exposed to exp-L2 (n=112) had a significantly lower risk of TST conversion (P=0.016) compared to those exposed to non-exp-L2 strains (N=110). Paradoxically, the prevalence of exp-L2 nearly doubled—from 6.6% to 12.6%—during the ten years. Immunological studies suggest that exp-L2 infection induces hypo-inflammatory transcriptional responses in macrophages. In an aerosol infection model using C3HeB/FeJ mice, exp-L2-elicited T cells produced lower levels of protective Th1 cytokines IFN-γ and TNF-α in response to Mtb-specific antigens, compared to non-exp-L2 infection. These features may facilitate immune evasion and lead to under-detection by both household-based and routine TB control programs.
Individuals infected with exp-L2 may be less likely to receive TB preventive therapy due to false-negative TST results. These findings suggest that the exp-L2 may gain a selective advantage via immune evasion, allowing it to escape TST-based detection and intervention under current TB control strategies.

TBS-EP98 Molecular profiles and functional dynamics of monocyte mRNAs across TB infection spectrum

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Background: Monocyte expansion and altered subset frequencies in TB, as observed through phenotypic and transcriptomic studies, are closely associated with disease severity, heightened inflammation, and immune dysregulation. Building on these findings, we hypothesize that monocyte-driven molecular signatures could provide valuable insights into the underlying pathophysiology, regulatory mechanisms across the TB spectrum, towards identifying the biomarkers and monocyte directed therapeutics.
Methods: We sorted total monocytes including all three subsets (HLA-DR+CD14+, HLA-DR+CD14+CD16+, and HLA-DR+CD16+cells) from peripheral blood mononuclear cells of healthy and TB-infected and diseased (latent TB [LTB], pulmonary drug-sensitive TB [DS-TB] and pulmonary drug-resistant TB [DR-TB]) individuals through flow cytometry and subjected to Illumina-based mRNA sequencing. Gene co-expression modules were constructed using Weighted Gene Co-Expression Network Analysis and organized into functional clusters using k-means clustering. Module clusters were annotated for functional enrichment using large language models.
Results: The analysis identified 7,749 differentially expressed genes across all group comparisons, with 5,729 upregulated and 2,020 downregulated. The transcriptomic landscape of active TB revealed marked hyperactivation of multifunctional pathways, contrasting with their

suppression in LTB. Enrichment analyses highlighted significant upregulation of immune-related pathways, cell migration dynamics, secretory functions, cell death signalling, ER stress, and oxidative responses in active pulmonary TB, underscoring critical shifts in monocyte gene functionality.
Notably, DR-TB showed a distinct inflammatory secretory signature, with a parallel reduction in classical monocyte gene expression, suggesting a coordinated shift in monocyte functional programming. WGCNA identified 33 co-expression modules organized into 5 functionally distinct clusters. Trajectory analysis revealed disease-specific expression patterns. Our biomarker analysis identified several genes with potential diagnostic value, of which 35 (32 for DS-TB and 3 for DR-TB) were bioinformatically validated as treatment-responsive biomarkers through comparison with public datasets.
Conclusion: These findings highlight how monocyte functional states are systematically altered and provide insights into host-pathogen interactions across the TB disease spectrum.

TBS-EP101 Improving the efficiency of drug resistant tuberculosis treatment trials: A time-to-event alternative marker for bacteriological response and adaptive minimization for randomization

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Background: Establishing the efficacy of new rifampicin-resistant tuberculosis (RR-TB) treatments is challenging due to the long-term clinical endpoint of relapse-free survival. We aimed to evaluate the effect of an alternative indicator of treatment response on sample size requirements and the use of a minimization strategy for randomization.
Methods: Sample size estimates were compared between a commonly used endpoint of proportion of patients achieving stable culture conversion at 12 weeks (SCC_{12}) and a novel indicator of treatment response based on a model of changes in mycobacterial load (MBL) over time. The non-linear mixed effects model, calibrated using data from an RR-TB cohort, included a longitudinal MBL decline, a probabilistic component for mycobacteria presence in sputum, and a time-to-event model for culture positivity. Data were simulated for a prespecified treatment effect to compare the power of detecting the treatment effect for various sample sizes when using either the SCC_{12} endpoint or the novel alternative change in MBL indicator of treatment response. Additionally, the impact of random patient allocation versus a minimization strategy for randomization on covariate imbalance was assessed.
Results: To achieve 80% power, 410 individuals were needed using the commonly used SCC_{12} endpoint versus 110 participants when using the non-linear mixed effects MBL model, corresponding to a 73% reduction in sample size. A small sample size results in high baseline covariate imbalance with random treatment group allocation, with a median relative imbalance of 0.104 for 110 participants versus 0.053 for 410 participants. This imbalance was reduced to 0.036 for 110 participants when an adaptive minimization procedure was implemented.
Conclusion: Using a model of MBL changes over time as an alternative indicator of treatment response, combined with a minimization procedure during the randomization process, significantly reduced the sample size. This approach could, if validated, enhance the efficiency of RR-TB clinical trials design.

TBS-EP104 Assessment of effect of weight on pyrazinamide pharmacokinetics in support of flat dosing in adults with TB

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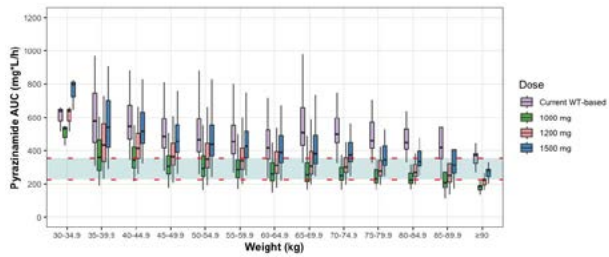
Background: The current dosing regimen of pyrazinamide for tuberculosis is based on body weight derived from concerns at higher doses. The largest pyrazinamide exposure-response and safety analysis was performed and showed that weight was not a clinically significant predictor of clearance, suggesting the validity of a 1,000 mg flat dose. However, according to the analysis, the bioavailability of pyrazinamide was affected by dose levels preventing a clear evaluation of the weight effect on clearance which is influenced by bioavailability.
Therefore, we aimed to demonstrate the effect of weight on pyrazinamide pharmacokinetics (PK) using flat dosing data excluding the dose effect and to strengthen the dosing strategy for adults with tuberculosis.
Methods: Data from three phase 2 clinical trials (NC-002, NC-005, and SimpliciTB) and one phase 3 clinical trial (STAND) were used to develop the population PK modeling. Population PK modeling was performed using NONMEM and linear, power, and piecewise linear relationship were explored to explain the weight effect on PK parameters. We compared the proportion of participants within therapeutic window across the current weight-based and flat dosing strategies.
Results: A total of 820 participants with 1500 mg flat dose were included. The PK of pyrazinamide was appropriately explained by a one-compartment model, first-order absorption with lag time, and first-order elimination. The

effect of weight on clearance and volume of distribution was best described by a linear relationship, indicating that the clearance increases by approximately 11% for every 10 kg increase in body weight. The flat dosing of pyrazinamide with 1,000 mg achieved 55% of participants within the therapeutic window while current weight-based dosing achieved 12%.



Conclusions: This analysis indicated that the effect of weight on pyrazinamide PK was not significant factor to justify weight-based dosing and a flat dosing of pyrazinamide with 1,000 mg once-daily would be appropriate.

TBS-EP107 Impact of nutritional support on transcriptomics of persons with latent tuberculosis infection: Why does nutritional support prevent TB?

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Background: Nutritionally acquired immunodeficiency is a recognized risk factor for progression from latent tuberculosis infection (LTBI) to active TB disease. Emerging evidence indicates nutritional support can reduce incident TB in household contacts, though the underlying mechanisms remain unclear.
Methods: The TB LION study prospectively followed a cohort of household contacts with LTBI in southern India. Undernourished participants (BMI <18.5 kg/m²) received nutritional supplementation consisting of a food basket (2600 kcal/day and 80g protein/day for adults; half for children under 13 years) and multivitamins. Enough food was provided for the entire household for a duration of 6 months. Helminth-infected participants received antihelminthic treatment. Bulk RNA-seq was performed on blood samples from 98 participants at baseline and after 6 months. Data analyses included dimensionality reduction, differential expression via limma, Ingenuity Pathway Analysis (IPA), and assessment of TB progression risk signatures (RISK4 and PREDICT29) using TBSignatureProfiler.
Results: Undernourished participants exhibited distinct baseline transcriptomic profiles compared to well-nourished controls, characterized by elevated proinflammatory gene expression, particularly in the interferon-gamma signaling pathway. Post-intervention analyses showed downregulation of TB progression-associated genes (C1QA, SERPING1, SIGLEC1) and reduced expression of the inflammation-centric RISK4 signature, though the PREDICT29 signature remained unchanged. Pathway analysis indicated decreased interferon-alpha signaling and attenuated TLR7 and TLR9 signaling, suggesting enhanced antigen presentation and autophagy following nutritional supplementation.

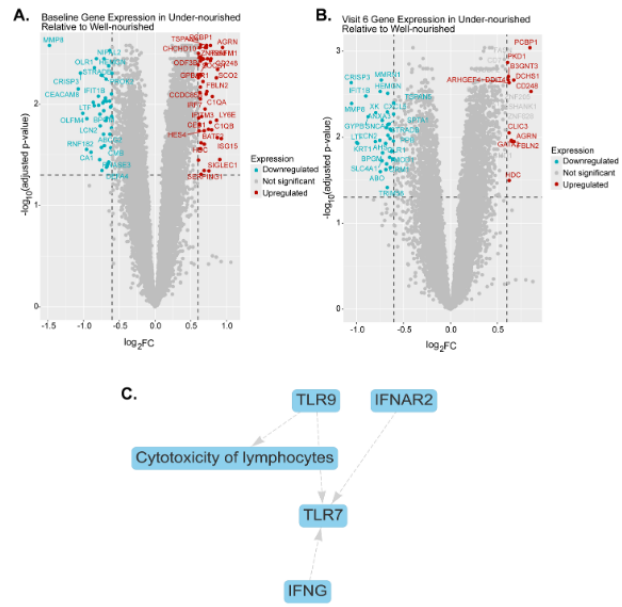

Figure overview: Differentially expressed genes (DEGs) from undernourished individuals (BMI < 18.5) relative to well-nourished individuals at baseline (A) and after nutritional intervention (B). DEGs between baseline and post-nutritional intervention were analyzed with Qiagen's IPA and decreased interferon alpha and gamma signaling was associated with nutritional intervention (C).

Conclusion: Malnourished individuals with LTBI demonstrate proinflammatory transcriptomic profiles distinct from their well-nourished counterparts. Nutritional support modulates these profiles, promoting changes associated with improved innate and adaptive immune responses that may reduce TB progression risk.

TBS-EP110 Bioanalytical strategies to support the development of novel anti-TB drug regimens

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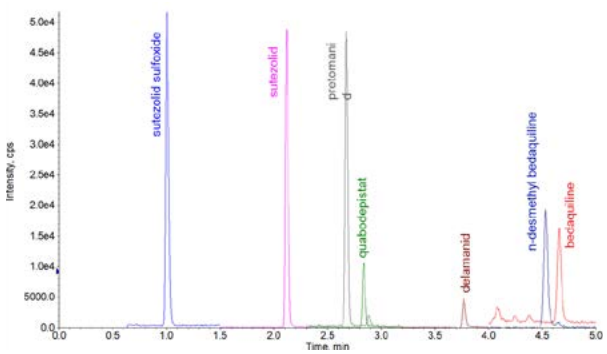
Background: Generating pharmacokinetic data for clinical trials and regulatory submissions often involves multiple validated analytical methods. In the recent multi-drug multi-regimen PAN-TB trial, three distinct LC-MS/MS assays were required, complicating scheduling and logistics, and significantly increasing analytical costs and timelines. Developing a single, multi-analyte assay presents analytical challenges but offers substantial benefits, including reduced operational complexity, lowers analytical costs, expedites analyses, and reduces blood volume requirements for participants.
Design/Methods: A single LC-MS/MS method was developed and validated to simultaneously quantify key drugs in novel regimens: pretomanid, delamanid, quabodepistat, sutezolid, sutezolid sulfoxide, bedaquiline, and n-desmethyl bedaquiline. Sample preparation involved protein precipitation, followed by chromatographic separation on a Synergi Polar RP column. Detection was performed using a SCIEX API 6500+ with positive ion MRM scans across five scanning periods to optimize peak resolution and achieve the required LLOQ. Stable isotope-labeled internal standards were used except for quabodepistat. All compounds were sourced from commercial suppliers.
Results: Simultaneous chromatographic separation of seven analytes with a wide range of physicochemical properties (cLogP from -0.1 to 7.2) was achieved within an 8-minute run time. The validated assay range for all analytes was 10–10,000 ng/mL. Between-run accuracy ranged from 95.8% to 106.6%, and precision from 1.3% to 9.8%. Stability was confirmed for all analytes in whole blood (2 hours on wet ice), plasma (12 hours at 4°C), through three freeze-thaw cycles, and for 84 hours post-extraction at 4°C. The efficiencies of this assay will be highlighted and compared with the execution of multiple assays.



Conclusions: This work demonstrates the successful development and validation of a robust multi-analyte LC-MS/MS assay capable of supporting the pharmacokinetic evaluation of novel TB regimens. The method accommodates a broad range of analyte properties and offers significant advantages in terms of efficiency, cost, and minimizing blood volumes.

TBS-EP113 Genotypic-phenotypic discordance and emerging drug resistance in rifampicin-resistant extrapulmonary tuberculosis

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Background: Rifampicin-resistant extrapulmonary tuberculosis (RR-EPTB) presents diagnostic and therapeutic challenges due to its paucibacillary nature and limited availability of extended drug susceptibility testing (DST). This study aimed to characterize resistance profiles in culture-confirmed RR-EPTB cases using phenotypic and genotypic
Methods: This prospective study included 31 culture-positive RR-EPTB isolates from the Intermediate Reference Laboratory, King George's Medical University, Lucknow. Phenotypic DST was performed using the BACTEC MGIT 960 system for isoniazid (INH), pyrazinamide (PZA), moxifloxacin (MOX), bedaquiline (BDQ), delamanid (DLM), pretomanid (PTM), and linezolid (LZD). Genotypic resistance was determined using MTBDRplus and MTBDRsl line probe assays (Hain Lifescience), targeting mutations in *katG*, *inhA*, *gyrA*, *gyrB*, *rrs*, and *eis* genes.
Results: All 31 isolates were resistant to rifampicin and isoniazid, confirming MDR-TB. Phenotypic resistance was observed for PZA in 13 (41.9%), MOX in 11 (35.4%), BDQ in 2 (6.5%), and PTM in 2 (6.5%) isolates; all were susceptible to LZD and DLM.
Among INH-resistant isolates, *katG* mutations were seen in 21 (67.7%), *inhA* in 4 (12.9%), and both in 6 (19.3%). LPA detected fluoroquinolone resistance-associated mutations in 16 (51.6%) isolates, while phenotypic MOX resistance was found in 11 (35.4%). One isolate showed second-line injectable resistance. Based on combined findings, 16 (51.6%) were pre-XDR and 2 (6.5%) XDR-TB.
Conclusion: A significant proportion of RR-EPTB isolates showed additional resistance to fluoroquinolones and newer agents such as BDQ and PTM. Discordance between genotypic and phenotypic resistance to fluoroquinolones highlights the need for both methods. Routine second-line DST, including newer drugs, is essential for personalized RR-EPTB management.

Keywords: RR-EPTB, MDR-TB, Pre-XDR-TB, XDR-TB, Line Probe Assay, DST, Fluoroquinolone, Bedaquiline

TBS-EP116 Urine LAM quantification using ultrasensitive single-molecule counting technology: A novel approach for improved tuberculosis diagnosis and treatment monitoring

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Background: There is a need for rapid and sensitive non-sputum diagnostic tools for pulmonary and extrapulmonary tuberculosis (TB) in all patient populations. Lipoarabinomannan (LAM), a mycobacterial glycolipid, is a validated TB biomarker in urine, particularly in people living with HIV.
However, LAM concentrations in patient samples are typically very low and existing assays have limited sensitivity. Quantitative, ultrasensitive detection of LAM may enable a novel approach for diagnosis and treatment monitoring.
Methods: An ultrasensitive LAM assay was developed using Fluxus' single-molecule counting platform, which integrates optics and microfluidics for biomarker detection. Limits of detection (LoD) and quantification (LoQ), dilution linearity, intra- and interassay precision, spike recovery, and matrix compatibility were determined.
Clinical sample testing was performed using biobanked specimens from ten adults with suspected TB; patient sputum samples had been tested for presence of *M. tuberculosis* using smear microscopy, culture, and nucleic acid amplification test, and urine LAM concentration had been quantified using electrochemiluminescence assay. Testing in larger cohorts is ongoing.
Results: LoD and LoQ were 0.068 and ~2 pg/mL, respectively, with a >5-log dynamic range. Mean spike recovery across 0.01–100 ng/mL was 106%, and dilution linearity was 102%. Intraassay and interassay CVs averaged 7.4% and <15%, respectively. No crossreactivity was observed with *Mycobacterium smegmatis* LAM.
LAM was detected in urine from all patients with microbiologically confirmed TB (n=4) and not detected in non-TB patients (n=6), and concentrations were comparable to those observed using electrochemiluminescence.
Conclusions: Fluxus' ultrasensitive LAM assay demonstrates strong analytical performance and sub-pg/mL sensitivity. The assay detected LAM in urine from all patients with TB and was negative in all non-TB patients, and concentrations were comparable to those observed with a quantitative method. Fluxus' platform supports the development of a non-sputum tool for TB diagnosis and treatment monitoring, addressing a critical gap in high-burden, resource-limited settings.

TBS-EP119 Development of a CRISPR-Cas13a based SNP assay for detection of bedaquiline resistance in *Mycobacterium tuberculosis*

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Bedaquiline (BDQ) treatment for multidrug-resistant (MDR) and extensively drug-resistant (XDR) tuberculosis began in the Philippines in June 2016. Single nucleotide polymorphisms (SNPs) in the *atpE* gene, particularly Ala63Pro (A63P; GCA→CCA), are linked to BDQ drug resistance. Development of detection tools for SNP based drug resistance still posed challenges in molecular diagnostics. To address this, Specific High Sensitivity Enzymatic Reporter UnLOCKing (SHERLOCK) was utilized to enable SNP detection dependent on CRISPR-Cas13a system and programmable rational crRNA design. This study aimed to develop CRISPR-Cas13a-based SHERLOCK fluorescence assay for rapid and specific detection of A63P mutation.
Three rational crRNA designs were generated through optimized in-house overlap extension PCR and invitro transcription protocol. Their discriminatory ability was evaluated using synthetic wild-type (WT) and mutant (MT) RNA, with SHERLOCK fluorescence monitored over 2 hours at 5-minute intervals. The mutant-to-wild-type signal ratio (MT/WT) was calculated to determine crRNA performance across time points. All endpoint SHERLOCK reactions were confirmed via electrophoresis to visualize cleaved RNA.
crRNA2 exhibited the highest discriminatory power, achieving a signal ratio of 14.88 at 30 minutes(N=3), compared to 3.90 for crRNA1(N=3) and 2.20 for crRNA3(N=3). Although the other two designs can effectively discriminate, crRNA2 was chosen for assay simplification integrating T7 transcription and SHERLOCK-Cas13a detection in one reaction allowing DNA as starting input. Optimization of SHERLOCK components enabled this conversion to one-step detection, yielding a signal ratio of 4.34 at 30 minutes (N=3). Notably, higher DNA input allowed fluorescence-based differentiation between WT and MT as early as 5 minutes offering flexibility in reducing detection time dependent on the assay sensitivity requirements.

These findings demonstrate the potential of a CRISPR-Cas13a SHERLOCK assay via a programmable crRNA rational design for SNP-based BDQ resistance testing. Furthermore, the platform shows potential for application for the detection of other *Mtb* genes harboring SNPs linked to drug resistance.

TBS-EP122 Breaking the TB Cycle: AI-driven mobile X-ray screening with CAD4TB enhances early detection in high-risk coal mining communities of Punjab, Pakistan

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Summary: A 2024 study in Punjab, Pakistan, used AI-powered mobile X-ray screening (CAD4TB) to detect TB among 34,500 coal miners, revealing a prevalence of 522 per 100,000—nearly double the national incidence. This underscores AI's role in early TB detection and supports targeted interventions.

Background: Tuberculosis (TB) poses a significant occupational health risk for coal miners in Pakistan, with Punjab accounting for 55–60% of the national TB burden (277 per 100,000) [1]. Punjab province accounts for approximately 55-60% of this burden, with 290,000 cases reported in 2024 (Provincial TB Control Program, Punjab, 2024). Miners face heightened risks from silica dust exposure and limited healthcare access. Globally, TB prevalence in mining communities ranges from 1,200–2,500 per 100,000 [2]. This study evaluates AI-assisted active case finding (ACF) using mobile X-ray screening with CAD4TB to enhance early TB detection in this high-risk group.

Design/Methods: In 2024, a cross-sectional study screened 34,500 coal miners across Punjab using mobile X-ray units with CAD4TB, a deep-learning tool for TB detection. X-rays scoring ≥60 were flagged for GeneXpert MTB/RIF testing. Risk factors, including silica exposure and healthcare access, were documented, aligning with WHO screening guidelines [3].

Results: Of 7,260 X-rays analyzed, 1,704 (23.5%) were flagged, leading to 180 confirmed TB cases (prevalence: 522 per 100,000), nearly double the national incidence (277 per 100,000). The case detection rate was 10.6%, with silica exposure and poor healthcare access as key risk factors, consistent with global mining trends [2,4].

Conclusions: The high TB prevalence among coal miners supports their classification as a high-risk group under WHO guidelines. AI-driven mobile screening offers a scalable, high-impact approach for early detection. Policy recommendations include silica dust mitigation and nationwide AI-assisted ACF, aligning with WHO's End TB Strategy to enhance Pakistan's TB control [5].

Parameter	Value / Finding
Study Population	Coal Miners, Punjab
Total Individuals Screened	34,500
Individuals with CXR suggestive of TB (CAD4TB Score ≥60)	1,704 (4.94% of screened)
Bacteriologically Confirmed TB Cases (via Xpert MTB/RIF)	180
Yield among Presumptive Cases (Confirmed TB / CAD4TB ≥60)	10.6%
Prevalence of Confirmed TB among Screened Coal Miners	522 per 100,000
National TB Incidence (Pakistan, WHO 2024)	277 per 100,000
Relative Burden in Coal Miners vs. General Population	1.89 times higher
Key Technology Utilized	Mobile Digital X-ray, CAD4TB (AI), GeneXpert MTB/RIF

TBS-EP125 Treatment of chronic pulmonary cavitary aspergillosis using an endobronchial valve and local antifungal therapy

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Introduction: Aspergillosis can affect cavitary lung lesions that develop after infectious diseases, often tuberculosis. Sometimes, fungal growth within the cavity progresses to form a mycetoma, which is clearly visible on computed tomography (CT) scans of the lungs. Aspergillosis impedes the healing of cavitary lesions, even if the preceding infection has resolved favorably. Patients with chronic pulmonary cavitary aspergillosis (CPCA) may experience various respiratory and constitutional symptoms, including dyspnea, persistent cough, hemoptysis, sputum production, chest discomfort, weight loss, fatigue, and general malaise.

Treatment for CPCA involves long-term (4–12 months) antifungal therapy with a high risk of adverse effects or surgical intervention.

Objectives: This study explored the possibility of treating CPCA using local antifungal drug administration combined with endobronchial valve (EBV) placement.

Materials and Methods: Six patients with CPCA in post-tuberculosis lung cavities were treated. The diagnosis was confirmed by laboratory testing (Aspergillus was detected in lavage fluid from the cavity). Drug susceptibility of the pathogen was determined.
Treatment involved EBV (MedLung, Russia) placement via fiberoptic bronchoscopy into the lobar, zonal, or segmental bronchus draining the CPCA cavity. After 3–6 days, a single daily intravenous dose of antifungal medication (10 mL) was administered once through a plastic catheter into the space distal to the EBV during repeat bronchoscopy.
Results: In five patients, the cavity healed within three months. One patient retained a thin-walled cavity. CPCA was successfully treated in all six patients, as confirmed by CT and laboratory tests.
Conclusions: Successful CPCA treatment is facilitated by high local antifungal drug concentrations and prolonged direct exposure to Aspergillus, achieved through combined EBV placement and localized antifungal administration.

TBS-EP128 Diagnostic accuracy of a novel high-sensitivity urine LAM assay

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Lipoarabinomannan (LAM) is a tuberculosis (TB) biomarker detected in urine, but the current commercially available urine LAM test has low sensitivity and is recommended only for TB diagnosis in people living with HIV (PLHIV). A next generation LAM prototype leverages a novel sample pre-treatment, sample concentration and advanced lateral flow assay to increase sensitivity.
Between October 2024 and February 2025, we enrolled consecutive people ≥12 years old with presumptive TB (based on having cough ≥2 weeks or being HIV-positive with C-reactive protein >5 mg/L) at outpatient health centers in Kampala, Uganda and Cape Town, South Africa.
Participants provided urine for next generation LAM prototype (Ref. 08FK60) and Determine TB LAM Ag (Determine LAM; Abbott, USA) testing and sputum for Xpert MTB/RIF Ultra and two MGIT cultures. Diagnostic accuracy of the LAM prototype was assessed against sputum-based reference standards and compared it with Determine LAM.
Among 192 participants (median age 36, 52% female, 36% PLHIV, 14% living with diabetes), 3 (1.6%) test results were invalid on the first LAM prototype test, but all returned valid test results after repeat testing. Prototype LAM sensitivity was 53.5% (23/43, 95% confidence interval [CI] 37.7-68.8) against culture and 63.2% (24/38, 95% CI 46.0-78.2) against Xpert Ultra. Specificity exceeded 98% against both reference standards. The LAM prototype had higher sensitivity (53.5% vs. 11.6%, difference +41.9%, 95% CI 24.8-58.9) and specificity (99.2% vs. 94.0%, difference +5.0%, 95% CI 0.2–10.3) than Determine LAM. It performed better in PLHIV compared to in HIV-negative participants (sensitivity against culture 72.7% vs. 46.9%). However, accuracy of the LAM prototype exceeded Determine LAM in both subgroups.
This next generation LAM prototype demonstrated improved sensitivity and specificity over the current LAM test and has potential for broader use in TB diagnosis. Further evaluation of its usability and performance in diverse settings is warranted.

	Next generation LAM prototype		Determine TB LAM		Difference in sensitivity	Difference in specificity
	Sensitivity	Specificity	Sensitivity	Specificity		
Reference standard: MGIT culture						
Overall	23/43 (53.5%, 37.7-68.8)	132/133 (99.2%, 95.9-100)	5/43 (11.6%, 3.9-25.1)	125/133 (94.0%, 88.5-97.4)	+41.9% (24.8-58.9)	+5.3% (0.2, 10.3)
HIV-positive	8/11 (72.7%, 39.0-94.0)	50/51 (98%, 89.6-100)	2/11 (18.2%, 2.3-51.8)	47/51 (92.2%, 81.1-97.8)	+54.5% (16.0-93.1)	+5.9% (-4.5, 16.3)
HIV-negative	15/32 (46.9%, 29.1-65.3)	82/82 (100%, 95.6-100)	3/32 (9.4%, 2.0-25.0)	78/82 (95.1%, 2.0-25.0)	+37.5% (17.6-57.4)	+4.9% (-1.0, 10.8)
Reference standard: Sputum Xpert Ultra						
Overall	24/38 (63.2%, 46.0-78.2)	145/147 (98.6%, 95.2-99.8)	5/38 (13.2%, 4.4-28.1)	139/147 (94.6%, 89.6-97.6)	+50.0% (31.5, 68.5)	+4.1% (-0.8, 8.9%)
HIV-positive	8/8 (100%, 63.1-100)	57/59 (96.6%, 88.3-99.6)	2/8 (25.0%, 3.2-65.1)	55/59 (93.2%, 83.5-98.1)	+75.0% (32.5-117.5)	+3.4% (-6.4, 13.2)
HIV-negative	16/30 (53.3%, 34.3-71.7)	88/88 (100%, 95.9-100)	3/30 (10.0%, 2.1-26.5)	84/88 (95.5%, 88.8-98.7)	+43.4% (22.3-64.4)	+4.5% (-0.9, 10.0)

TBS-EP131 Host and pathogen diversity influence the efficacy of tyrosine kinase inhibitor–based host-directed therapies in tuberculosis

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Host-directed therapies (HDTs) offer a promising adjunctive strategy for tuberculosis (TB) treatment by enhancing host immunity and mitigating post-treatment pathology. However, the lack of a universally effective HDT reflects underlying variability in host immune responses and *the diversity of the Mycobacterium tuberculosis complex (MTBC) lineages*, factors often overlooked in translational research.

We evaluated the efficacy of tyrosine kinase inhibitors (TKIs), including Imatinib, Gefitinib, and Erlotinib, using an ex vivo monocyte infection model with clinical MTBC strains. Monocytes from 111 Gambian TB patients (3 months post-treatment) were infected (MOI = 1) with fluorescently labelled isolates representing Mtb-lineage2, Mtb-lineage4, *Mycobacterium bovis*, and West African *Mycobacterium africanum* lineages 5 and 6. Infected monocytes were treated or left untreated, and the intracellular bacterial burden was quantified by fluorescence over 7 days. Supernatants were assayed for 48 cytokines. Responders were defined as patients whose monocytes exhibited reduced bacterial fluorescence with TKI treatment compared to controls by day 7. Multivariable linear models with Bayesian information criterion (BIC)–based variable selection were used to identify clinical and immune correlates of TKI response.

Erlotinib achieved the highest proportion of responders (59%), followed by Gefitinib (36%) and Imatinib (27%). Erlotinib-mediated bacterial control was consistent across MTBC lineages, while response to Gefitinib and Imatinib varied markedly by lineage.

Distinct cytokine signatures were associated with TKI responsiveness: doubling of IL-12p70 and IL-13 levels predicted reduced response to Erlotinib and Gefitinib in Mtb-lineage 2 and Maf-lineage 6 infections, respectively. In contrast, male sex and elevated IL-7 were associated with enhanced response.

TKIs, particularly Erlotinib, show promise as HDT candidates across diverse MTBC lineages. However, their efficacy is modulated by both the host immune profile and the infecting MTBC strain. These findings underscore the need for precision-based HDT strategies that integrate host immune profiling and pathogen diversity to optimise TB treatment outcomes.

TBS-EP134 Nitroimidazole resistance amongst people with tuberculosis: A meta-analysis of prevalence and genotypic-phenotypic concordance

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Background: Delamanid and pretomanid are nitroimadazoles licensed for the treatment of RR-TB, and their usage has increased rapidly over the last 5 years. Global rates of baseline and emergent resistance have not been evaluated. Targeted/whole genome sequencing is a potentially cost effective and scalable diagnostic for these drugs, but WHO mutation catalogue sensitivity for resistance is only 14.7%.

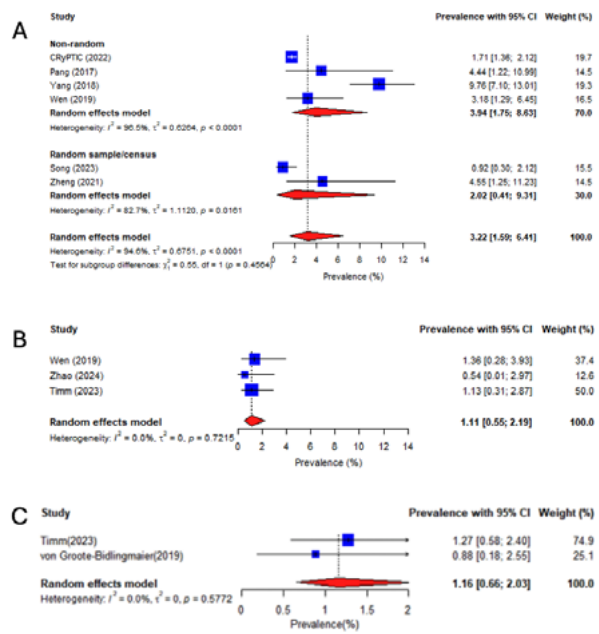
We report a meta-analysis of studies evaluating nitroimidazole resistance in patients and determine theoretical performance of a genomic resistance test utilising all mutations in candidate resistance genes (*fbiA/B/C/D*, *ddn*, *fgd1*).

Methods: The study protocol was registered in PROSPERO (CRD42023469823). We screened public databases for articles published up to April 2025. We included studies which reported nitroimidazole resistance by phenotyping and genome sequencing of *Mtb* isolates obtained from patients with RR-TB.

Results: The systematic search identified 914 abstracts, 866 of which were eligible for further screening. We reviewed 803 full texts and 30 studies met all inclusion criteria.

Amongst patients with RR-TB, pooled prevalence of baseline phenotypic delamanid resistance was 3.22% (95% CI 1.59%-6.41%) (**FigA**) and pretomanid resistance was 1.11% (0.55%-2.19%) (**FigB**). The pooled prevalence of treatment-emergent phenotypic nitroimidazole resistance amongst people with TB receiving a nitroimidazole-containing regimen was 1.16% (0.66%-2.03%) (**FigC**).

From the clinical isolates analysed, 3383 had ³1 mutation in a candidate gene, of which 255 were phenotypically resistant to delamanid. Sensitivity of candidate gene variants for delamanid resistance was 62.7% (255/407), specificity was 74.2% (9118/12491) and positive predictive value (PPV) was 7.5% (255/3383). *ddn* variants were more predictive of resistance (PPV 46.3%) than those in other genes, but occurred less frequently.



Conclusions: Nitroimidazole resistance prevalence in patients with RR-TB is 1-3%, and emergent resistance occurs in 1%. These rates originate from isolates collected before widespread nitroimidazole use for TB. Resistance-associated gene mutations do not explain >30% of clinical delamanid resistance.

TBS-EP137 Diagnostic performance of a new near-point-of-care assay to detect TB from tongue and sputum swabs

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Background: New near point-of-care assays, including the MTB Nucleic Acid Test Card (Pluslife, China), have the potential to replace or complement existing rapid molecular diagnostics for TB in different settings and populations. Compared to existing rapid diagnostics, these new assays are less expensive, more portable, and designed to test tongue and sputum swab specimens. Evaluations of the diagnostic performance of these assays are needed.M
Methods: We conducted a prospective diagnostic accuracy study at five health facilities and in active case-finding (ACF) in two regions of Cameroon. Consecutive people ≥15 years with presumptive TB were recruited; each participant was asked to provide at least two tongue swabs (self or provider collected) and two sputum specimens.
We evaluated the diagnostic accuracy of the PlusLife tongue and sputum swabs against a sputum culture microbiological reference standard, as well as to comparators of sputum Xpert MTB/RIF Ultra and smear microscopy.
Results: From February to May 2025, 984 participants were recruited at health facilities (634) and community screening events (350), including 163 (17%) people living with HIV. Among participants, 818 (83%) chose supervised self-collection of tongue swabs. Among 138 people (14%) with TB detected on sputum Ultra, TB was detected on PlusLife from sputum swabs in 87% (77/89; 95%CI: 78-92%) at health facilities and 57% (28/49; 43-70%) in ACF; TB was detected in tongue swabs from 79% (70/89; 69-86%) at health facilities and 44% (22/50; 31-58%) in ACF. Performance evaluation compared to TB culture is ongoing.
Conclusion: As an inexpensive, highly portable assay, the PlusLife MiniDock MTB assay may facilitate increased access to molecular testing for TB with acceptable accuracy, especially among people seeking care at health facilities.

TBS-EP140 A multi-arm multi-stage trial design using desirability of outcome ranking and stratified medicine for MDR-TB

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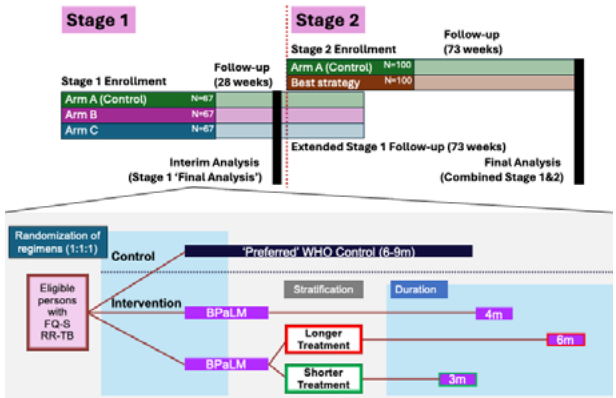
Background: The 2025 WHO guidelines for treatment of multidrug-resistant tuberculosis (MDR-TB) include six 6-9 month regimens, yet all are cited as conditional recommendations with very low certainty of evidence. Drug toxicities remain an important concern and meta-analyses suggest that shorter treatment durations can be effective. Novel trial designs are needed to evaluate new regimens that can yield strong recommendations.
Methods: The PRISM-TB (NCT06441006) trial aims to identify, among participants with fluoroquinolone-susceptible-MDR-TB, the preferred BPaLM strategy for participants stratified to receive shorter (13 or 17 weeks) or longer treatment (17 or 24 weeks) based on risk criteria, and to evaluate whether this BPaLM strategy has noninferior 73-week efficacy to the control. PRISM has

a novel, seamless Phase 2/3 design that combines three innovative elements. First, four stratified treatment strategies are evaluated, testing two durations in each of two subgroups.
Second, a multi-arm multi-stage design is employed to select the preferred strategy, leading to faster results with fewer participants.
Third, a novel person-centered ordinal endpoint combining efficacy, safety, and tolerability is used in Phase 2 to guide progression to Phase 3, which uses a traditional 73-week endpoint.
Results: In Stage 1, 200 participants will be randomized to a standard-of-care control or one of two experimental arms, representing four possible treatment strategies. The primary endpoint uses desirability of outcome ranking (DOOR), combining efficacy at end of follow-up and safety at 28-weeks post-randomization. After DSMB review of the results, acceptability, and feasibility, one experimental strategy will advance to Stage 2, where 200 additional participants will be randomized between this strategy and the control. We expect 90% power to demonstrate noninferiority of the preferred strategy with a 12% noninferiority margin.



Conclusions: By implementing a staged and stratified design, PRISM-TB offers a novel approach that can efficiently identify and evaluate the optimal treatment duration for MDR-TB.

TBS-EP143 Machine learning of plasma multi-omics data distinguishes pulmonary tuberculosis from other respiratory infections

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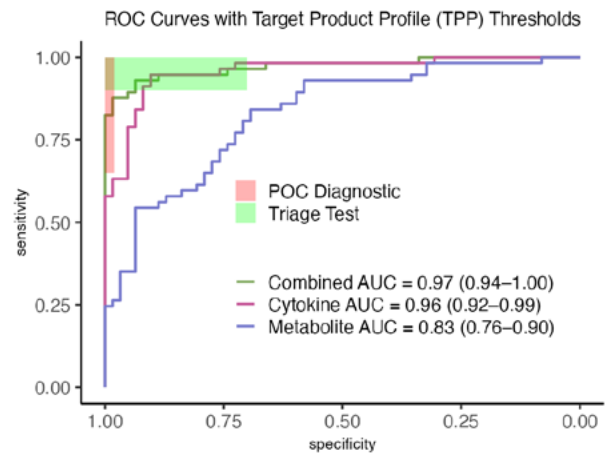
Novel blood-based biomarkers for tuberculosis (TB) are needed to develop rapid, point-of-care diagnostics. We applied an artificial intelligence (AI) approach using random forest feature selection on multi-omics data to identify a biomarker signature that differentiates pulmonary TB (PTB) from other respiratory infections in hospitalized and ambulatory persons with presumed TB.
We analyzed plasma samples from 391 adults (≥18 years) presenting with respiratory symptoms suggestive of TB, including 187 with PTB confirmed by Xpert MTB/RIF Ultra and/or *M. tuberculosis* sputum culture and 204 in whom PTB was excluded. The latter included 165 hospitalized participants and 39 people who had contact with someone with pulmonary TB. Plasma concentrations of 28 cytokines and 118 metabolites were integrated for biomarker discovery. Random forest models were trained on 70% of the dataset and evaluated on the remaining 30%.
Among participants with PTB, 41% were female, mean age was 35 years, and 21% were people living with HIV (PLWH). The control group was 50% female, mean age was 51 years, and 20% were PLWH. The random forest feature selection identified five cytokines (IFN-γ, IL-1β, IL-22, IL-10, and IFN-β) and two metabolites (methionine and oxoproline). The combined cytokine-metabolite model achieved an AUC of 0.97 (95% CI: 0.94–1.00) in the test set. Both the cytokine-only and combined model had 95% sensitivity (95% CI: 89%–100%) at 80% specificity. However, at 98% specificity, sensitivity was higher in the combined model at 88% (95%CI: 75%–96%) versus the cytokine-only model [63% sensitivity (95% CI: 47%–93%)]. The combined model showed consistent performance (AUC=0.97, 95% CI: 0.90-1.00) regardless of HIV status and across both hospitalized and ambulatory participants.



This plasma biomarker signature meets the optimal WHO target product profile for both non-sputum triage and diagnostic TB tests, highlighting the value of AI-driven biomarker discovery approaches to improve TB diagnosis.

TBS-EP146 Field Deployment of a TB-Mobile Diagnostic System (TB-MDS) for Latent Tuberculosis Infection (LTBI) detection in Resource-limited Setting

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With an estimated 2 billion individuals affected by LTBI worldwide, majority of the LTBI population is within resource-limiting regions and 5%-10% are at risk of progressing to active TB. Addressing LTBI is critical to achieving the WHO's END-TB strategy. IGRA (Interferon-Gamma Release Assay) is only the effective diagnostic method of LTBI detection due to the high specificity and sensitivity, but the adaption of IGRA in the TB high-burden countries is largely limited due to its high cost and lab instrument requirements. We reported here a TB-Mobile Diagnostic System (TB-MDS) which is designed to be implemented in community health centers in Resource-limited countries.

TB-MDS is a completed system which includes all lyophilized IGRA reagents (AIMTB), auto incubator (AIM 37), fluorescence chromatographic Analyzer, and standardized consumable suite (endotoxin-free blood collection tubes, pre-loaded pipettes, and consumables). The whole system is room temperature stable for 18 months, easy to transportation (22 kg in weight), and simple to operation. In field validation studies, TB-MDS can be reliably run over 24 hours of continuous operation without grid power, novice operators achieved proficiency within 30 minutes of training, and its assay performance achieved 98.2% agreement with laboratory-based IGRA reference assay.

Fig 1: TB- Mobile Diagnostic System (TB-MDS) components and Operational Workflow
1)TB-MDS; 2) Blood Collection, Collect blood into the three-chamber stimulation tubes (Negative, T, Positive) and label accordingly; 3) Gently invert to mix; 4) Incubate in the portable incubator (AIM37) at 37°C for 20 hours; 5) Centrifuge the tubes at 1000 g for 5 minutes; 6) Sample Loading into the lateral flow card. Incubate for 15 minutes; 7) Detection by the fluorescence detector.

TB-MDS provides one viable for decentralized LTBI detection in remote, disaster-affected, and other primary care settings. Its mobility, simplicity, and reliability support the global drive toward TB eradication.

TBS-EP149 Comparing early outcomes of BPaL-L and 9-month regimens for drug-resistant tuberculosis in South Africa

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Background: South Africa bears a high burden of drug-resistant tuberculosis (DR-TB), historically associated with poor outcomes due to lengthy, toxic regimens. Following WHO recommendation of BPaLM (bedaquiline, pretomanid, linezolid, moxifloxacin), South Africa introduced BPaL-L (bedaquiline, pretomanid, linezolid, levofloxacin), a 6-month all-oral regimen replacing moxifloxacin with levofloxacin, aiming for improved efficacy, safety, and shorter treatment duration.

Methods: We conducted a retrospective review of routinely collected data from the national DR-TB database (EDRWeb), describing patient characteristics, outcomes and adverse events for those initiated on BPaL-L between 1st September 2023 and 30th June 2024. Multivariate logistic regression identified factors associated with unfavourable outcomes.

Results: During the study period, 4,718 patients were initiated on BPaL-L across 445 facilities in 49/52 districts. The median age was 38 years; 62% being male and 62% HIV-positive. Treatment outcomes for BPaL-L showed 75% treatment success rate, with 9% LTFU and 7% mortality.

In comparison, among 1,285 patients initiated on the 9-month regimen during the same period, the treatment success rate was 62%, LTFU rate14% and mortality rate 13%.

Of 744 reported adverse events during this period for BPaL-L, anaemia was the commonest with 221/744 (30%) followed by peripheral neuropathy 93/744 (13%).

Unfavourable outcomes were associated with previous DR-TB (OR 1.9, 95% CI 1.5–2.5), undernutrition (OR 1.3, 95% CI 1.1–1.6), HIV-positive status without antiretroviral therapy (ART) (OR 4.2, 95% CI 1.8–9.9), and unknown ART status (OR 5.1, 95% CI 2.1–12.4). Nurse-initiated treatment was protective (OR 0.7, 95% CI 0.6–0.9).

Discussion: Early implementation and robust real-time monitoring of the BPaL-L regimen in South Africa demonstrated an improved treatment success rate and acceptable safety in routine settings. These findings are showing that the introduction of BPaL-L was a very good decision that has potential to enhance DR-TB care in South Africa.

TBS-EP152 *M. tuberculosis* exosome detection in peripheral blood for pediatric TB

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Background: Non-sputum-based diagnostics for pediatric tuberculosis (TB) are urgently needed, as children are often missed by conventional respiratory sampling. We developed a nanoplasmon-enhanced scattering (nPES) assay to detect *Mycobacterium tuberculosis*-specific lipoarabinomannan (LAM) and its carrier protein LprG within extracellular vesicles (EVs) derived from endosomal compartments and circulating in peripheral blood.
Methods: We tested cryopreserved plasma from two Kenyan cohorts: children with suspected TB (PDTBDx) and healthy infants without known TB exposure (MITIPS). PDTBDx participants underwent sputum or gastric aspirate testing via Xpert and culture, with plasma collected at baseline. MITIPS infants had plasma collected at 6 weeks of age and were followed for 2 years, remaining tuberculin skin test (TST) negative at both 1 and 2 years, with no hospitalizations beyond birth and no known TB exposure.
Results: Among 47 symptomatic PDTBDx participants (53% female, median age 4 years [IQR 1.5–7.6]), 25% (12/47) had microbiologically confirmed TB, and 70% (33/47) initiated TB treatment. Among 20 healthy MITIPS infants, 65% were female and all received BCG vaccination at birth. In symptomatic PDTBDx participants, median nPES-detected LAM and LprG levels were 39.4 AU (IQR 30.7–45.4) and 50.3 AU (IQR 43.6–55.2), respectively, with similar values in children with confirmed and clinically diagnosed TB. Sensitivity was 100% (12/12) among children with confirmed TB (LAM 100%, LprG 75.0%) with LAM identifying 95.2% and LprG identifying 85.7% additional children with clinical TB diagnosis. In healthy infants, median LAM and LprG levels were 23.5 AU (IQR 20.4–25.4) and 29.0 AU (IQR 27.6–31.2), respectively. Specificity was 90% (18/20), with LAM and LprG specificities of 90% and 100%, respectively.
Conclusion: The nPES assay demonstrated high sensitivity for detecting LAM and LprG in symptomatic children with confirmed TB. Detection in children without microbiologic confirmation may reflect TB missed by respiratory sampling.

TBS-EP155 MAMS_6 – A novel transcriptome-informed quantitative real-time PCR-based signature for monitoring tuberculosis treatment success

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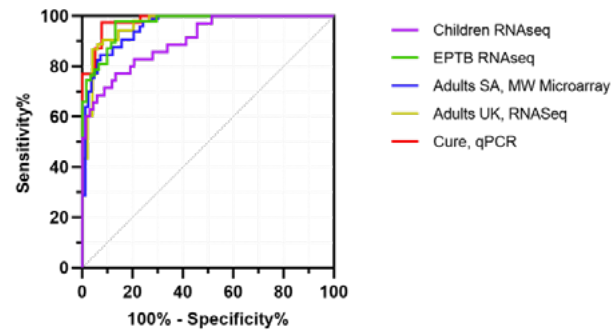
Background: Timely diagnosis and effective treatment monitoring remain key challenges in tuberculosis (TB) care. There is an urgent need for reliable, sputum-independent biomarkers to support rapid diagnosis and assess treatment response.
Methods: Through a multi-step process, we developed a parsimonious real-time quantitative PCR (RT-qPCR) signature for TB cure. Whole blood transcriptomes from participants in the Phase IIB PanACEA MAMS-TB-01 trial (n=21) conducted in South Africa and Tanzania were profiled using RNA sequencing at baseline and at weeks 2, 12, and 26 of treatment. We prioritised genes highly differentially expressed in this study and appearing in published signatures to develop an RT-qPCR-based assay. Gene expression was quantified using microfluidic RT-qPCR in a training (n=21) and validation cohort (n=39), followed by ROC curve analysis to identify genes discriminating between active and cured TB. The resulting six-gene signature, MAMS_6, was further validated using both in-house and public transcriptomic datasets.



ROC curves showing MAMS_6 signature performance across in-house and public datasets.
Red: TB at treatment start vs. end (MAMS validation cohort RT-qPCR). Yellow: TBI vs. TB (UK RNA-seq; Singhania, 2018). Blue: TBI vs. TB (African microarray; Kaforou, 2013). Green: Controls vs. extrapulmonary TB (RNA-seq; Blankley, 2016). Purple: TB vs. TBI (paediatric RNA-seq; Tornheim, 2020).

Results: TB treatment induced rapid and dynamic transcriptomic shifts, particularly in genes related to leukocyte activation and inflammatory signalling. The MAMS_6 signature demonstrated 97% sensitivity and 82% specificity for predicting treatment completion. Its performance was consistent across clinical subgroups and correlated with stable culture conversion. Additionally, MAMS_6 showed diagnostic utility in external datasets, highlighting its broader relevance.
Conclusion: The MAMS_6 RT-qPCR signature holds promise as a dual-purpose tool for TB diagnosis and treatment monitoring. It may be particularly valuable for individuals unable to reliably produce sputum, supporting more inclusive and effective TB care.

TBS-EP158 Automated cough frequency monitoring as a predictor of unfavorable TB outcomes

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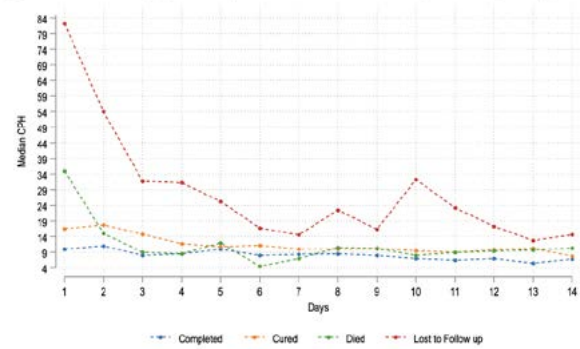
Background: AI-enabled mobile phone applications can support continuous and automated cough monitoring while on tuberculosis (TB) treatment. This has potential to serve as an early warning system to identify individuals at risk of unfavorable treatment outcomes.
Methods: We enrolled adults ≥18 years in Kampala, Uganda who were initiated on treatment for drug-sensitive pulmonary TB based on a microbiological (sputum Xpert MTB/RIF) or clinical diagnosis. We collected clinical and sociodemographic data, and participants wore smartphones for 14 days with the Hyfe application for automated cough detection. We calculated the daily median coughs per hour and applied an anomaly detection model to identify individuals with an extreme cough frequency. TB registry data were used to identify unfavorable outcomes (Death or loss to follow up). We developed a 10-fold cross validated LASSO regression model to predict unfavorable outcomes and calculated the accuracy.

Results: Among 152 participants, median age was 32 years (IQR 40-26), 66 (43.42%) were living with HIV, 94 (61.84%) had bacteriologically confirmed TB, and 6 (3.9%) had an unfavorable outcome (3 deaths and 3 lost to follow up). Participants with unfavorable outcomes had a higher median cough per hour on Day 1 than those who were cured or completed treatment, but levels were similar by Day 14 (Figure 1). A Day 1 cough frequency anomaly classified an unfavorable outcome with 83% sensitivity (95% CI 45-100) and 78% specificity (95% CI 25-85). When combined with presence of hemoptysis, microbiological TB status, and history of HIV, diabetes or allergies, sensitivity remained 83% and specificity improved to 94%.

Figure 1: Median Cough per hour by Treatment Outcome During the 14-days study period



Conclusions: Continuous automated cough monitoring in the first 24 hours identified individuals with unfavorable outcomes with high accuracy when combined with routine baseline clinical data and should be further evaluated as a TB treatment monitoring tool in larger validation studies.

TBS-EP161 Optimizing approaches to recover high quality *M. tuberculosis* genome-wide and within-host variation

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Mycobacterium tuberculosis (*Mtb*) genomic epidemiology studies often require culturing patient sputa, a time and labor-intensive process that can also impose a bottleneck on *Mtb* variation. Hybrid capture approaches have been successfully used to enrich *Mtb* DNA from complex clinical samples. However, the accuracy of both consensus and minority variants identified by hybrid capture approaches has not yet been evaluated, making it difficult to evaluate its more widespread utility.

We conducted a serial dilution experiment in which we mixed two *Mtb* DNA standards representing lineages 2 and 4, such that the minority strain represented 0-100% of the total DNA and then diluted *Mtb* DNA in human DNA, to simulate clinical samples which are overwhelmingly human DNA. We enriched for *Mtb* DNA with hybrid capture, conducted whole genome sequencing, and measured the performance of variant identification for both consensus and minority variants.

Additionally, we prospectively sampled matched *Mtb* diagnostic cultures and sputum and performed hybrid capture and Illumina whole genome sequencing on matched samples. In our serial dilution experiment, hybrid capture enabled efficient sequencing of *Mtb*, even when *Mtb* DNA comprised a small proportion of input DNA (97.3% efficiency when *Mtb* DNA comprised 0.01% of input DNA). Consensus SNP variants identified through hybrid capture were accurate, with a sensitivity of 97.1% and precision of 97.1% in a lineage 4 DNA standard, outside of PE/PPE genes. Observed minor allele frequencies were closely correlated ($r = 0.97$, $p < 0.001$) with input minor allele frequences. In our prospectively collected sputa samples, hybrid capture efficiency was high, >93%. Hybrid capture of clinical sputa samples can generate accurate *Mtb* whole genome sequences and minority variant calls, without the need for culture. Further optimization could make hybrid capture more practical for large-scale genomic epidemiology studies.

TBS-EP164 Benchmarking surrogate endpoints for relapse in TB trials: A statistical framework for assessing new biomarkers

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Background: Treatment monitoring in tuberculosis (TB) clinical trials still relies heavily on culture-based endpoints, despite well-known limitations in predicting relapse. A comprehensive statistical framework for evaluating TB surrogate endpoint biomarkers is lacking yet is essential to accelerate drug development.

Objective: We applied individual- and trial-level surrogate endpoint evaluation methods to culture-based data from recent late-phase TB clinical trials to quantify how well culture-based biomarkers predict relapse-free cure. Using state-of-the-art surrogate endpoint methodology, the objective of this work is to establish a statistical benchmark against which novel molecular biomarkers, such as the RS ratio, can be compared.

Methods: Using harmonized data from 7 trials (19 treatment arms, 4,614 participants), we applied the proportion of treatment effect explained (PTE) and meta-analytic surrogacy models to time to culture conversion in relation to relapse as the primary endpoint. We assessed individual-level and trial-level predictions of relapse across regimens.

Results: Our analyses show negligible trial-level relapse surrogacy for time to culture conversion ($R^2 \approx 0.1$) in a meta-regression. The trial-level effect was small with a wide confidence interval that contained zero, precluding estimation of a surrogate threshold effect (STE). The STE likely lies outside the range of observable values. PTE estimates were low, with an upper bound of ~10% for time to culture conversion. These findings affirm limitations of culture-based markers and demonstrate a generalizable evaluation framework that we will be applying to other molecular biomarkers.

Conclusion: Culture-based biomarkers describe treatment response but have only limited value as surrogate endpoints for relapse. Better biomarkers are needed to more efficiently guide TB regimen development. Our relapse surrogacy framework supports evaluation of emerging biomarkers. Future work will expand its application to culture time to positivity and to the RS ratio.

TBS-EP167 Pharmacogenomic prediction of adverse drug reactions to tuberculosis preventive therapy: Role of CYP2C19 and CYP2E1 polymorphisms in household contacts of TB patients

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Tuberculosis (TB) remains a global public health challenge, with preventive therapy (TPT) being a key strategy in reducing latent TB infection (LTBI) progression. However, adverse drug reactions (ADRs) associated with TPT regimens, particularly those containing rifapentine and isoniazid, impact adherence and treatment outcomes. This study investigates the role of genetic polymorphisms in drug-metabolizing enzymes, CYP2C19 and CYP2E1, in predicting ADRs among individuals receiving TPT.

Conducted in Kerala, India, this interventional study included 43 household contacts of TB patients. DNA extraction and genotyping for CYP2C19 (rs4986893) and CYP2E1 (rs2515641, rs2070676) were performed using TaqMan assays and T-ARMS PCR. Statistical analysis assessed the association between genetic variants and ADR occurrence.

Results indicate a significant correlation between CYP2C19 polymorphism and ADRs, with individuals carrying the CC genotype experiencing a higher incidence of ADRs (61.29%) compared to those with CT (20%). The TT genotype also showed an increased risk, though with a smaller sample size.

Notably, no genetic variation in CYP2E1 was observed, suggesting its limited role in ADR predisposition. The most common ADRs included sleepiness and lethargy (63.63%), hypersensitivity (27.27%), and gastrointestinal discomfort (18.18%).

The findings highlight the potential of pharmacogenomics in optimizing TPT regimens to enhance patient safety and adherence. Implementing genetic screening before initiating TPT may aid in personalized treatment approaches, reducing ADR incidence and improving therapeutic outcomes. Further studies with larger populations are required to validate these associations and facilitate precision medicine in TB management.

TBS-EP170 *CYP3A5* polymorphisms influence bedaquiline and clofazimine pharmacokinetics in clinical trial participants with MDR/RR-TB across six countries

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Background: The endTB (NCT02754765) and endTB-Q (NCT03896685) clinical trials evaluated the efficacy and safety of six experimental, all-oral regimens for fluoroquinolone-susceptible and fluoroquinolone-resistant multidrug/rifampicin-resistant tuberculosis (MDR/RR-TB). These regimens included new and repurposed drugs such as bedaquiline (BDQ), clofazimine (CFZ), and linezolid (LZD). As a sub-study of these trials, we investigated the pharmacogenetics of these drugs in trial participants.

Methods: We examined the association between *CYP3A5* rs776746 polymorphisms and the pharmacokinetics of BDQ, CFZ, and LZD in 143 participants from Kazakhstan, Lesotho, Pakistan, Peru, South Africa, and Vietnam. Genotyping was conducted using the Infinium Global Diversity Array with Enhanced PGx and TaqMan SNP assays. Genotypes were classified as AA (*1/*1, functional), AG (*1/*3, intermediate), and GG (*3/*3, nonfunctional). Individual clearance (CL) estimates for BDQ, CFZ, and LZD were derived from established population pharmacokinetics models. The Kruskal-Wallis test was used to compare CL across genotype groups.

Results: Among the 143 participants, the nonfunctional GG genotype was the most prevalent (51.7%, 74/143), followed by AG at 26.6% (38/143), and AA at 22.4% (32/143), with considerable variation by region. The nonfunctional GG genotype was absent in Lesotho and South Africa, followed by Pakistan (57.7%; 15/26), Kazakhstan (64.7%; 22/34), Vietnam (66.7%; 6/9) and Peru (72.1%; 31/43). Model-derived individual CL values were obtained for 94 CFZ-treated and 96 BDQ-treated participants using established pharmacokinetics models.

Significant differences in clearance were observed across *CYP3A5* genotypes for both CFZ ($p = 0.0118$) and BDQ ($p = 0.0189$), with lower mean clearance among individuals with the GG genotype consistent with reduced metabolic activity (Figure 1). No significant association was found between *CYP3A5* genotype and LZD clearance ($p= 0.9577$).

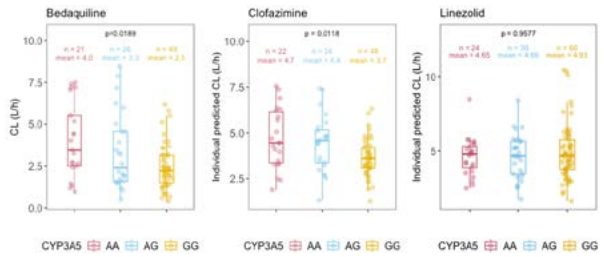

Figure 1.

Conclusion: *CYP3A5* genotype significantly affects BDQ and CFZ CL. Incorporating pharmacogenetic profiling into TB treatment strategies may support personalized dosing, especially in populations with a high prevalence of the nonfunctional GG variant.

TBS-EP176 Urinary extracellular vesicle-linked lipoarabinomannan for precise diagnosis of active tuberculosis

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Lipoarabinomannan, a glycolipid component of the *Mycobacterium tuberculosis* (Mtb) cell wall, is an important determinant of immunogenicity, and it has been recently validated in clinical studies as a marker of active tuberculosis infection. LAM (Lipoarabinomannan) is known to be present on culture Mtb infected eukaryotic cell extracellular vesicles, and LAM presence was confirmed in EVs of serum from tuberculosis patients.

We have found that urinary EVs are a new source of LAM as a diagnostic biomarker. Urine is a convenient non-invasive biofluid that collects and integrates molecular information over many hours yielding a higher abundance of diagnostic molecules than blood.

We conducted a clinical study showing that urine measurement of Mtb LAM achieved high sensitivity and specificity (0.90; 95% CI: 0.87-0.93, 90% sensitivity, 73.5% specificity, at a cut off of 80 pg/mL) in patients with active pulmonary and extrapulmonary (pleural, meningeal, laryngeal, bone, and ganglionic tuberculosis) tuberculosis (N=430), in absence or presence of co-morbidities (HIV and diabetes).

Patients and controls were accrued from five different countries: Peru, Guinea Bissau, Venezuela, Uganda and the United States. Structural variations of LAM influenced its diagnostic performance. Epitope 5-methylthio-D-xylofuranose (MTX)-mannose (Man) was less influenced by glycosuria and identified culture positive pediatric (N=19) and extrapulmonary (N=24) patients with high accuracy (ROAUC 0.87, 95% CI:0.77-0.98, 0.90 sensitivity 0.80 specificity at 80 pg/mL; ROAUC = 0.96, 95% CI:0.92-0.99, 96% sensitivity, 80% specificity at 82 pg/mL, respectively).

We are in the process of characterizing what class of urinary EVs contains LAM in patients with culture positive tuberculosis, and to evaluate what other Mtb molecules are associated with LAM-EVs.

Of particular interest are differences in LAM carbohydrate structure and, in particular, in the nonreducing terminal arabinan of LAM, that have important implications in prognosis, disease stage, immunogenicity, and diagnosis.

TBS-EP179 Sputum MGIT culture versus lipoarabinomannan (LAM) assay for evaluating regimen activity in phase 2B trials

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Background: Time to sputum culture conversion (TT**C**C) in mycobacterial growth indicator tube (MGIT) is a standard phase 2b trial outcome. Sputum lipoarabinomannan (LAM) has potential advantages over MGIT (unaffected by contamination; faster result; cheaper) but has not previously been evaluated in a 2b trial.

Methods: TRUNCATE-TB was a phase 2/3 adaptive trial using novel 8-week, 5-drug regimens within a treatment strategy. We analysed participants enrolled at 4sites in the Philippines; assigned to standard treatment or two fully-enrolled, novel 5-drug regimen groups (high-dose rifampicin and linezolid [RIF-LZD], or bedaquiline and linezolid [BDQ-LZD]; each given with isoniazid, pyrazinamide and ethambutol); and with positive baseline MGIT and LAM. MGIT time to positivity (TTP) was analysed in real-time. LAM concentration was measured in stored decontaminated sputum samples at trial end using PATHFAST TB LAM Ag test. Baseline TTP and LAM were compared by Spearman's test; TT**C**C (time to first of two negative MGIT cultures to week 8) and time to LAM conversion (TT**L**C; time to first of two consecutive LAM results below 10pg/ml) by Kaplan-Meier methods; and hazard ratio (HR-**C**C and HR-**L**C) by Cox model.

Results: Correlation (negative) between TTP and LAM at baseline was good (> 0.85, all 3 groups). TT**C**C was similar to standard regimen and HR-**C**C compared to standard regimen was increased to a similar extent in both novel treatment regimens (Table).

TT**L**C was slower in RIF-LZD than in the standard or BDQ-LZD regimen, and the HR-**L**C compared to standard treatment was lower in RIF-LZD (1.17) than in BDQ-LZD regimen (1.41).

	r (TTP vs LAM)	TTCC median (95%CI), days	TTLC median (95%CI), days	HR-CC (95%CI) vs standard	HR-LC (95%CI) vs standard
Standard regimen (n=37)	-0.90	41 (30-52)	30 (29-56)	(reference)	(reference)
RIF-LZD regimen (n=39)	-0.85	40 (29-43)	40 (29-43)	1.43 (0.87–2.37)	1.17 (0.69-1.99)
BDQ-LZD regimen (n=41)	-0.85	41 (39-43)	30 (29-43)	1.54 (0.95-2.52)	1.41 (0.85-2.34)

Conclusion: TTP and LAM showed reasonable agreement. LAM identified RIF-LZD as potentially the less efficacious of the two novel regimens (consistent with later performance on phase 3 relapse outcome).
Initial findings support inclusion of LAM in phase 2b trials to gain further experience on utility for predicting regimen efficacy.

TBS-EP182 Deep learning on longitudinal chest CT predicts treatment outcomes in multidrug-resistant tuberculosis: A multicentre retrospective study

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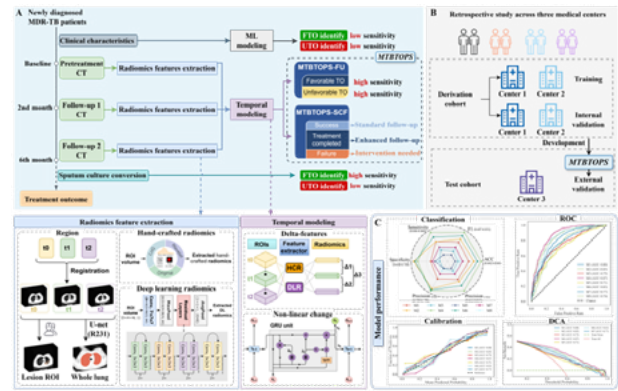
Background: Multidrug-resistant tuberculosis (MDR-TB) poses a significant global health threat, with persistently low treatment success rates despite prolonged, individualized therapies. Traditional clinical and microbiological predictors show limited performance in forecasting treatment outcomes.
This study aimed to develop a deep learning-based system that integrates longitudinal chest CT imaging to predict MDR-TB treatment outcomes.
Methods: We conducted a retrospective multicenter cohort study involving 265 patients with multidrug-resistant tuberculosis from three hospitals in China. Each patient underwent chest CT imaging at baseline, at two months, and at six months after the initiation of treatment. Radiomics features, including both handcrafted features and features derived from deep learning methods, were extracted from manually segmented lesions and the entire lung regions.
A total of 64 predictive models were developed by combining different radiomics strategies with various temporal modeling approaches. The optimal model, named MTBTOPS, was selected based on its performance in both internal and external validation cohorts. Model performance was assessed using classification metrics, receiver operating characteristic curves, calibration curves, and decision curve analysis.
Findings: MTBTOPS achieved superior predictive accuracy in both binary (favorable vs. unfavorable outcome) and multiclass (success, completion, failure) tasks.
In the test cohort, the best-performing model yielded an AUC of 0.838 (MTBTOPS-FC) and 0.849 (MTBTOPS-SCF), significantly outperforming clinical and microbiological indicators, such as 6-month sputum culture conversion.
The integration of three-timepoint CT data and GRU-based temporal modeling significantly enhanced predictive performance over static imaging or clinical variables alone.



Interpretation: This study demonstrates the potential of longitudinal CT-based deep learning to improve early, non-invasive prediction of MDR-TB treatment outcomes. By enabling individualized risk stratification and timely intervention, the MTBTOPS framework may inform precision treatment strategies and resource allocation in high-burden settings.

TBS-EP185 Development of a biomarker to monitor children treated for non-severe tuberculosis

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Background: SHINE was a randomised phase 3 multi-country trial which found that 4-months of standard treatment was non-inferior to 6-months for non-severe tuberculosis (TB) drug-susceptible in children, allowing for global treatment shortening recommends. There are however no biomarkers of treatment response that allow for tailoring treatment in individual children.

We aimed to identify a transcriptomic signature of treatment response in children and assess its viability as a biomarker of treatment response.
Methods: Of children enrolled into SHINE, 198 children enrolled in Cape Town were retrospectively classified into having confirmed, unconfirmed, and unlikely TB by an independent endpoint committee (n=771 samples). PAXgene whole blood RNA samples were collected at enrolment, 2, 8 weeks, and at the end of treatment (week 16 or 24), and expression of 85 TB-associated genes measured by qPCR, compared across treatment timepoints.
Results: Using the enrolment and end -of-treatment samples in the confirmed TB group (n=37), we identified a new 4-gene monitoring biomarker-based disease risk score (area under the receiver operating characteristic curve, AUROC: 0.89, 95% CI: 0.81-0.97). Performance did not significantly differ between the 4- and 6-month arms. This signature was also validated in an independent, publicly available RNA-Seq dataset of children from India with TB (n=16, PMID: 31796955, AUROC: 0.81, 95% CI: 0.64-0.98).
We adapted this 4-gene signature into a monitoring score, with equal weighting assigned per gene. A score of 1 was assigned per gene if its expression value was within 1.5 standard deviations of each groups averaged end of treatment value, subsequently summed (Figure 1).

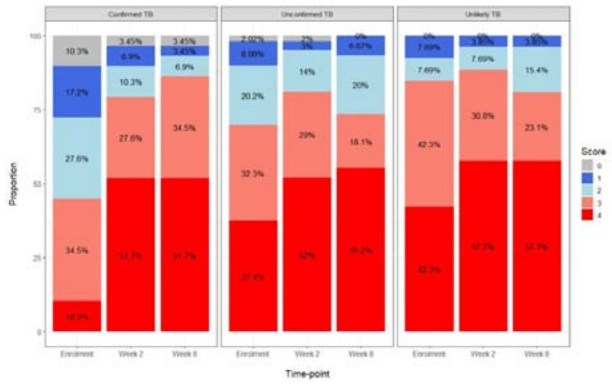

Figure.1 Monitoring score proof of concept – higher scores associated with a return to "baseline" expression levels.

Conclusions: We have demonstrated proof of principle that a novel transcriptomic treatment monitoring biomarker could be used to measure antituberculosis treatment responses in children allowing for future tailored of treatment in children.

TBS-EP188 Novel nanoparticle respiratory tract mucosal tuberculosis vaccine

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Background: We developed/tested a BCG intranasal mucosal booster vaccine comprised of three *Mycobacterium tuberculosis* (*Mtb*) surface or secreted antigens. Importantly, there is increasing evidence that mucosal immune responses are important for protection against diseases that initially interact with mucosal cells. Epithelial cells, including the respiratory epithelium and particularly alveolar epithelial cells (AECs), are primary targets for mucosal vaccines.
Design/Methods: The three *Mtb* proteins chosen for this study include HBHA, an epithelial cell heparin-binding hemagglutinin adhesin, Rv3351c, which induces host cell lipid rafts, and ESAT6 (early secretory antigenic target 6) which forms pores in host cell membranes. We showed that *Mtb* native HBHA and recombinant Rv3351c and ESAT6 administered subcutaneously or intranasally induced such immune responses in mice.
Thus, we hypothesized that combining these three epithelial cell-targeting *Mtb* proteins as an intranasal booster vaccine with BCG prime will drive robust protective mucosal, cellular, and humoral responses in the lungs compared to subcutaneous vaccination with BCG alone.
Results: As hypothesized, intranasal delivery of the booster preparations composed of PLGA nanoparticles with VacSIM matrix were the most protective in mice as demonstrated by lung (and spleen) CFU numbers being less by greater than 1.0 log , showed less lung necrosis and granuloma formations, and overall affected lung areas also were less than mice only BCG vaccinated.
Although all cytokine levels were relatively higher than BCG alone, generally lower levels of pro-inflammatory cytokine TNF-a and increased production of IL-17 and IFN-g were observed in mice booster vaccinated.
Conclusions: Our nanoparticle intranasal mucosal booster vaccine generated greater protection than BCG alone through lower lung (and spleen) CFU numbers, less lung necrosis and granuloma formations, and less overall affected lung areas, and with the accelerated recruitment of protective Th1 cells by the enhanced production of IFNg and IL-17 and reduction proinflammatory cytokines.

TBS-EP191 Adaptation of MBLA for quantification of bacterial load in the clinical routine laboratory

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Background: Rapid quantification of *M. tuberculosis* (Mtb) is important for monitoring bacterial load during treatment and in clinical studies but time to positive culture (TTP) is a slow method unsuitable for clinical practice. The molecular bacterial load assay (MBLA) by detection of 16S rRNA is a much faster method, quantifying the bacterial load within hours. However, the sample preparation of MBLA involves toxic chemicals and manual RNA-extraction, making it less feasible for the routine clinical laboratories or large sample sizes. Thus, our aim was to optimize MBLA to facilitate implementation in clinical settings and trials.
Method: First, several strategies to inactivate sputum samples containing Mtb or *M. avium* were compared including GTC-DTT recommended by the current MBLA kit as well as 8% acetic acid, 1M NaOH and heating for 20 minutes at 80°C. The kit-recommended phenol-chloroform RNA-extraction was compared to automated extraction with Qiagen (RNA Tissue Mini kit) and Maelstrom (TANBead Nucleic Acid Extraction Kit Tissue RNA) using Mtb-spiked sputum samples from 10^6 to 10^1 CFU/ml.
Results: The most efficient inactivation procedure was heating at 80°C whereas GTC-DTT did not inactivate Mtb. Also, sample homogenization by bead beating (MP FastPrep) and DNAse (Turbo DNAse kit) treatment following RNA-extraction were found to be essential steps. Automated RNA-extraction by Maelstrom had a lower detection limit (10^3/ml) than Qiagen (10^4/ml) and performed similarly to phenol-chloroform extraction with a detection limit of 10-100 CFU (median Ct levels: 35 (33.4-36.4) and 34.2 (33.6-35.6), n=6).

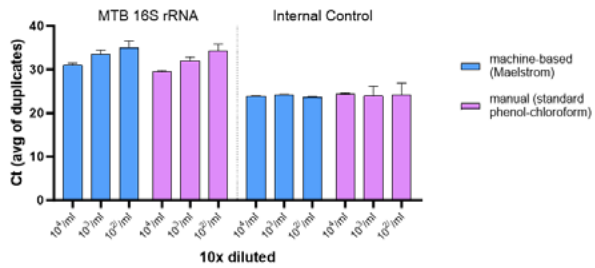

Fig.1. Spiked-sputum samples were heat-inactivated at 80° for 20 min and an extraction control (100µl/sample) was added to all samples. RNA samples were diluted 10x and Mtb was quantified by qPCR following standard phenol-chloroform manual RNA extraction protocol or machine-based RNA extraction protocol. Data are presented as median Ct-values (n=6).

Discussion: We adapted the MBLA method for rapid throughput by using heating at 80°C for 20 minutes followed by automated RNA-extraction achieving equal sensitivity compared to the original MBLA method with more time-consuming phenol-chloroform based extraction. The updated MBLA method will now replace TTP for determination of clinical load in routine as well as in future clinical trials.

TBS-EP197 Strain-specific host-pathogen sympatry drives tuberculosis spread and drug resistance dissemination in Nigeria

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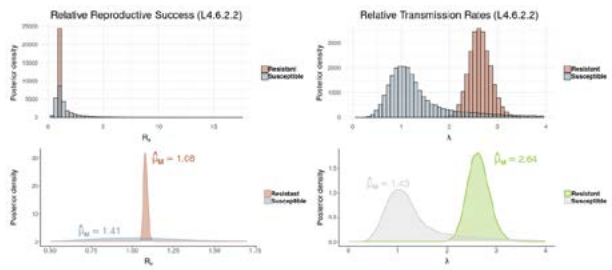
Background: Global tuberculosis (TB) research and scientific efforts have often focused on a few globally disseminated *Mycobacterium tuberculosis* (*Mtb*) lineages. However, in many high-burden settings, transmission is predominantly driven by geographically restricted strains characterized by long-term co-localization with host populations. These "specialist" lineages remain underrepresented in research guiding vaccine and therapeutic development.
Therefore, to inform more context-sensitive interventions, it is essential to quantify the epidemiological contributions of sympatric and allopatric *Mtb* subgroups in settings where multiple lineages coexist.
Methods: We analyzed whole-genome sequences (WGS) and associated metadata of *Mtb* isolates collected across Nigeria over a 15-year period. Isolates were stratified by sub-lineage, drug resistance (DR), and host-pathogen sympatry status. Using Bayesian phylodynamic modeling and ancestral sequence reconstruction, we estimated changes in population composition over time for parameters including transmission rates, effective population size, reproductive success, and resistance acquisition or dissemination timelines. We used these parameters to infer the relative transmission fitness of circulating subgroups in Nigeria.
Results: Analysis of 400 WGS samples revealed that Lineage 4.6.2.2, compared to other circulating strains in Nigeria, has expanded more than 2-fold in effective population size and prevalence over the past 20 years. DR-conferring mutations did not attenuate L4.6.2.2 dominance and relative fitness. Notably, DR L4.6.2.2 strains harbor-

ing *rpoB* S450L mutations were significantly ($p < 0.001$) more associated with higher "transmitter status," reproductive success, and elevated transmission rates relative to other (sub)lineages regardless of their "specialists" or "generalists" status.



Discussion: This study demonstrates the role of strain-specific adaptation and host-pathogen co-localization in driving DR-TB transmission in Nigeria. The epidemiological success of L4.6.2.2 with its sympatric hosts supports a reframing of the global TB burden estimates "more" as the cumulative outcome of diverse, localized epidemics fueled by highly-adapted, regionally restricted lineages. Integrating this perspective will be crucial to refining and achieving global TB prevention targets.

TBS-EP200 Prominent *M. tuberculosis* biomarkers among sputum culture-negative patients

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Background: Highly-sensitive molecular tests like GeneXpert MTB/RIF Ultra improve detection of paucibacillary pulmonary tuberculosis (TB) but occasionally detect *Mycobacterium tuberculosis* (Mtb) DNA in sputum from culture-negative individuals, with unclear significance. We hypothesized that Ultra may be detecting culture-negative TB, and manifest in a higher prevalence of TB biomarkers compared to Ultra-negative/culture-negative ('sputum-negative') individuals.
Methods: From 1200 symptomatic African adults undergoing evaluation for TB, we identified 66 with sputum-discordant results (Ultra-positive, culture-negative), and matched 52 sputum-negative (Ultra-negative, culture-negative) and 30 sputum-positive (Ultra-positive, culture-positive) participants. Over 12 months, participants were assessed for Mtb biomarkers (Mtb growth in augmented or follow-up sputum cultures, Mtb mRNA in baseline sputum, and symptomatic Ultra-positive after baseline) and TB-associated host transcriptional signatures.
Results: At baseline, Mtb bacterial biomarker(s) were detected in 16.7 % of sputum-discordant and 26.9% of sputum-negative patients ($p = 0.26$). Longitudinally, 26.5 % of untreated sputum-discordant versus 41.7 % of untreated sputum-negative participants had Mtb bacterial biomarkers ($p = 0.17$) despite most reporting symptom improvement. Notably, 30% of untreated sputum-negative participants converted to Ultra-positive at month 2. One sputum-discordant and one sputum-negative participant developed culture-confirmed TB at follow-up.
Conclusion: TB bacterial and host biomarkers were prevalent and no different between sputum-discordant and sputum-negative participants, raising concern for a considerable population of undiagnosed culture-negative TB. These findings parallel new evidence of Mtb aerosolization from sputum-negative individuals and highlight a need for more comprehensive diagnostics that detect sputum culture-negative TB with respect to infectiousness, pathology, and risk of progression.

	Sputum-DISC (n = 66)	Sputum-NEG (n = 52)	p-value Sp-Neg-Disc	Sputum-POS (n = 30)
Any Mtb bacterial biomarker -% (n/ N_{all})	16.7% (11/66)	26.9% (14/52)	0.26	N/A
Mtb growth in extended incubation MGIT cultures[1] - % (n/N_{all})	1.7% (1/58)	0.0% (0/51)	1.00	N/A
Mtb mRNA detected in baseline sputum[2] - % (n/ N_{all})	15.2% (10/66)	26.9% (14/52)	0.17	93.1% (27/29)
Any longitudinal Mtb bacterial biomarker - % (n/$N_{untreated}$)	26.5% (9/34)	41.7% (20/48)	0.17	N/A
Mtb growth in month 2 supplemented cultures[4] - % (n/$N_{untreated}$)	10.3% (3/29)	9.8% (4/41)	1.00	N/A
Progression to culture-positive TB (longitudinal) - % (n/$N_{untreated}$)	2.9% (1/34)	2.1% (1/48)	1.00	N/A

[1]Extended MGIT culture results missing for eight discordants and one sputum-negative.
[2]Sputum samples for mRNA analysis not collected from one sputum-positive.
[3]Nine discordants lost to follow-up prior to month 2 and two discordants LTFU after month 2 phone visit excluded from "untreated".
[4]Supplemented month 2 MGIT results are missing for five untreated discordants and seven untreated sputum-negatives.

Table. Frequencies of baseline and longitudinal TB disease biomarkers among sputum-discordant, sputum-negative, and sputum-positive cohorts.

TBS-EP203 Performance of the *DREstimator* tool to predict the phenotypic effect of genomic variants in *Mycobacterium tuberculosis* – A validation study

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Background: The WHO catalogue greatly advanced knowledge on phenotypic resistance associated with genomic variants, but 70% of variants are classified as of 'uncertain significance' due to lack of statistical associations. This complicates the use of next generation sequencing (NGS) results for clinical care.
Methods: We developed the *DREstimator* tool to integrate results of AI models predicting the impact of mutations on protein structure and function, expanded expert grading rules, and paired genotype-phenotype data. A Bayesian probabilistic framework then assigns a probability of drug resistance for each variant in tier 1/2 candidate drug resistance genes.
Performance was assessed for 14 drugs currently used for TB treatment using the Seq&Treat data as an independent validation dataset, the *MAGMA* pipeline for analysis of WGS data and MGIT phenotypic drug susceptability test (DST) results as the reference.
Results: Drug resistance predictions were computed for 51,355 variants detected in 723 Mtb isolates. Of the 19,047 (37%) variants classified in the WHO catalogue as of uncertain significance, the DRestimator classified 293 (1.5%) variants as having a high probability, 18,173 (95.4%) as low, and 581 (3.1%) as moderate probability of conferring phenotypic drug resistance.
The *DREstimator* achieved an overall 95.1% sensitivity and 90.5% specificity (Table). Sensitivity exceeded the WHO Target product profile threshold for next-generation drug-susceptibility testing for all drugs except linezolid (63%). Specificity was ≥90% except for rifampicin (80%), ethambutol (80%), amikacin (87%) and streptomycin (88%).

Drug	Variants assoc. with R (+interim)	Variants not assoc. with R (+interim)	Variants of uncertain significance	DREstimator Sensitivity	DREstimator Specificity
AMK	142 (4%)	1488 (41%)	2004 (55%)	97%	87%
BDQ	93 (2%)	2454 (57%)	1778 (41%)	84%	97%
CFZ	89 (1%)	3115 (47%)	3475 (52%)	92%	97%
EMB	409 (10%)	2579 (62%)	1166 (28%)	95%	80%
INH	672 (18%)	1913 (53%)	1062 (29%)	97%	95%
FQ	348 (9%)	2989 (79%)	455 (12%)	96%	96%
LIN	15 (1%)	790 (72%)	296 (27%)	63%	90%
PZA	376 (12%)	1880 (59%)	925 (29%)	92%	95%
RIF	586 (13%)	2969 (66%)	944 (21%)	99%	80%

Conclusion: The *DREstimator* can extend the predictive capability of sequencing data by employing state-of-the-art methods that go beyond statistical association. Our validation study suggests that WGS-based DST can exceed the requirements of the WHO target product profile for NGS DSTs for all drugs except linezolid. Paired genotype-phenotype data for pretomanid/delamanid should be generated and shared to further improve evaluation of the performance of genomic DST interpretation frameworks.

TBS-EP206 Revisiting the mouse model for tuberculosis-malaria co-infections through the natural routes to measure immunopathology and pathogen fitness

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Human tuberculosis (TB), caused primarily by *Mycobacterium tuberculosis* (*Mtb*), and malaria, transmitted by mosquitoes infected with *Plasmodium falciparum)*, together accounted for 273.8 million cases and 3 million deaths in 2023. While these diseases overlap geographically, the contribution of co-infection has received little attention. The role of host sex in immunomodulation is critical, as the number of TB cases in men is higher than in women, similarly, men carry malaria parasites longer than women.
We developed a mouse model to study TB-malaria co-infections, mimicking natural infection routes. In this study, we exposed mice to aerosolized *Mtb* followed by mosquito-mediated *P. berghei ANKA* (*Pb*); *Pb* induces cerebral human malaria-like pathology in mice. We hypothesized that *Mtb*-infected mice exposed to *Pb*-infected mosquitoes would show increased pathogen burden and immune pathology, with males experiencing exacerbated inflammation and reduced survival.
Male and female C57BL/6 mice were divided into four groups:
1. Mosquito bites only,
2. Only *Mtb* infected,
3. Only exposed to *Pb*-infected mosquitoes, and;
4. *Mtb* infected followed by exposure to *Pb*-infected mosquitoes at day 28.

Mice were euthanized at days 3–6 post-exposure, and blood, bronchoalveolar lavage (BAL), lung, spleen, liver, and brain were collected for pathogen burden, histopathology, immune cell infiltration, and cytokine/chemokine analysis.
We observed that the mouse model demonstrates higher bacterial and disease burdens (pathology) in males infected with *Mtb* bacilli alone. Second, bacterial and disease burdens were reduced in co-infected male mice than females. Third, these differences correlate with elevated Pb parasitemia and changes in percent immune effector

cells (CD4+ and CD8+) infiltrating the lungs. Finally, compared to mice infected with Pb alone, parasitemia was reduced in co-infected mice of both sexes. Systemic and localized cytokine and chemokine measurement and humoral response to individual infectious agents are ongoing.

TBS-EP209 Can emergence of canonical mechanisms of isoniazid resistance in tuberculosis be predicted?

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Resistance in *Mycobacterium tuberculosis*, the obligate pathogen of tuberculosis, typically follows a stepwise trajectory: isoniazid (INH) resistance often arises first, followed by resistance to rifampicin, pyrazinamide, ethambutol, and eventually second-line drugs. Preventing INH resistance may therefore delay or reduce broader drug resistance. This study investigates the prognostic value of specific mutations in predicting the emergence of canonical INH resistance mutations—*katG* S315T, *inhA*-15C>T, and *inhA*-8T>C.

We analyzed genomic and phenotypic data from over 16,000 isolates sourced from the TB Portals and the CRyPTIC consortium. Using logistic regression and deep neural networks, we trained predictive models on TB Portals data and validated them on CRyPTIC data. The top-performing model was a deep neural model, which identified promising prognostic mutations. We evaluated the predictive power of individual mutations and all two-mutation combinations using metrics including accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

The most effective model employed a combination of two prognostic genomic markers, achieving 73% accuracy, 55% sensitivity, 84% specificity, 69% PPV, and 75% NPV in predicting the emergence of the three canonical INH resistance mutations. While the sensitivity is moderate, it reflects the diversity of evolutionary pathways leading to INH resistance; our model captures only those involving the selected prognostic markers.

Our findings support the hypothesis that INH resistance in *M. tuberculosis* evolves in a stepwise manner, with identifiable genomic precursors. These results suggest that resistance prediction—and potentially prevention—may be possible through early genomic surveillance. Future studies with time-resolved datasets will be critical to uncover additional prognostic markers and map alternate evolutionary trajectories toward drug resistance.

TBS-EP212 Assessing the translational value of *in vitro* time-kill assays in TB drug regimens development

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To accelerate the timely introduction of novel tuberculosis (TB) treatments, innovative translational *in vitro* biomarkers and modeling approaches can be used. *In vitro* evaluations often test bacteria in exponential-phase in synthetic 7H9 glycerol medium and rely only on colony-forming units (CFU) as biomarker readout, which overlooks non-culturable bacteria, a limitation partially addressed in clinical trials by incorporating time to positivity (TTP).

Additionally, focusing only on exponential-phase bacteria may fail to capture drug efficacy against slower-growing populations.

Using BPaL - bedaquiline (BDQ, B), pretomanid (PTD, Pa), and linezolid (LZD, L)- as a model combination with *in vivo* and clinical available data, we generated predictive *in vitro* data and develop a translational modeling framework using *in vitro* time-kill assays (TKA) with novel biomarkers to interrogate different bacterial states.

We integrated additional biomarkers such as Most Probable Number (MPN) in TKA, which correlates with TTP, as well as RNA synthesis (RS) ratio and Molecular Bacterial Load Assay (MBLA) readouts, along with stationary-phase bacteria and the more physiologically relevant cholesterol medium.

First, we characterized natural bacterial growth over 110 days to establish baseline behavior, followed by 14-day TKA monotherapy to characterize the individual drug effect in both exponential and stationary conditions.

Then, conducted a 50-day combinatorial TKA, evaluating PTD and LZD´s effect on BDQ potency. Compound stability was measured by LC/MS-MS in the same TKA samples.

BDQ monotherapy showed delayed bactericidal activity. BPa demonstrated stronger interaction than BL. Overall potency was enhanced in the 3-drug combination with increasing PTD concentrations, while changes in LZD concentration had minimal impact. BDQ and Pa were the

key drivers of BPaL potency. Our *in vitro* data suggest that linezolid may be dispensable, leaving room for other improved drugs in development.
Future work will assess this *in vitro* translational framework to predict the activity of novel TB regimens.

TBS-EP215 Integrating Spatial Modelling and Contextual Data to Optimize the Identification of People Living with TB in Uganda

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Tuberculosis (TB) continues to affect many communities in Uganda. To enhance the efficiency of Active Case Finding (ACF), we developed a spatially resolved predictive model combining retrospective ACF data (2024–2025) with contextual vulnerability indicators. Our dataset included ACF screening volumes, bacteriologically confirmed TB (B+) identification rates, and geolocated demographic and environmental factors.
We applied a weighted k-means clustering algorithm to create approximately 10,000-sized Thiessen clusters across Uganda, aggregating all predictor variables and TB identification rates at the cluster level. Predictor features included population density, motorized travel time to health services, relative deprivation index, vaccination coverage, literacy levels, HIV prevalence, and malnutrition prevalence.
To evaluate model performance, we used district-level cross-validation by holding out all clusters within specific districts during training and using them solely for testing. We compared three machine learning algorithms—Naive Bayes (NB), Random Forest (RF), and XGBoost—using Relative Risk Increase (RRI) as the primary metric. We used RRI to quantify the relative identification yield of people living with TB in the top 30% predicted high-risk areas compared to the remaining 70%.
XGBoost showed the strongest performance, with an RRI of 0.74, indicating a 74% higher rate of diagnosing people living with TB in prioritized hotspots. NB and RF performed less effectively, demonstrating that XGBoost more reliably identified high-risk locations in unseen districts.
The final XGBoost model, retrained on all available cluster data, is deployed on the Epi-Control geoportal, enabling health teams to visualize and prioritize areas for targeted ACF activities.
This approach represents the first application of 10,000 weighted Thiessen clusters combined with district-level validation for TB risk modeling in Uganda. Ongoing updates will improve hotspot precision, supporting Uganda's National TB Program to optimize resource allocation and accelerate TB detection.

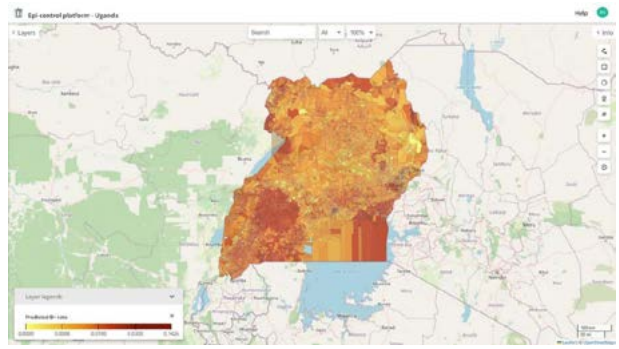

Fig. 1 - Visualisation of the TB Predictive Model: B+ rate

TBS-EP218 Spread and drug resistance of a lineage-2 *Mycobacterium tuberculosis* subgroup in Hanoi, Vietnam

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Background: Ongoing transmission combined with drug resistance makes tuberculosis difficult to control. We investigated the characteristics of *Mycobacterium tuberculosis* (Mtb) strains that have been more prevalent in Hanoi, Vietnam, over the past decade.
Methods: Patients newly diagnosed with smear-positive pulmonary tuberculosis were recruited into cohorts in 2007 and 2017. Mtb DNA was extracted from clinical isolates collected prior to treatment, and genome sequencing data, including drug resistance-conferring mutations, were obtained using a short-read (Illumina) sequencer with TB-Profiler version 4.3.
Results: Whole-genome sequencing was performed on 332 Mtb strains in 2007 and 320 in 2017. The proportion of predominant lineage-2 ancient Beijing strains rose from 36.8% (2007) to 48.1% (2017), largely driven by a phylogenetically defined subgroup designated as G strains, which increased from 14.8% to 27.5%. In the 2017 cohort, this G subgroup was more predominant among patients living in urban than sub-urban areas (31.5% vs. 18.4%, P = 0.028), a trend not observed in 2007. While drug resistance–conferring mutations were significantly more frequent in G strains in both cohorts, the higher

frequency of rifampicin resistance in these strains was significant only in the 2017 cohort (20.5% vs. 7.8%, P = 0.001).
In multivariate analyses, multidrug resistance was associated with G strains in the 2017 cohort (adjusted odds ratio = 3.90, 95% confident interval: 1.81–8.43), but not in 2007, after adjusting for patients' age, gender, and living area. Shorter phylogenetic terminal branch lengths of G strains (P < 0.0001 vs. other strains; P = 0.027 vs. other ancient Beijing strains) suggested recent transmission.
Conclusions: In Hanoi, a subgroup of ancient Beijing Mtb strains (G strains) expanded over ten years, becoming more drug-resistant and showing evidence of recent transmission. Further analyses are needed to elucidate contributing factors, and thus improve tuberculosis control, especially in urban areas of large cities.

TBS-EP221 Biomarker combinations of TB-MBLA with CFU and TTP give greater biological insight in EBA studies

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Introduction: Culture-based monitoring of bacterial load is slow and susceptible to missing data, contributing to the length and cost of TB clinical trials. Non-culture-based alternatives, like the Tuberculosis Molecular Load Bacterial Assay (TB-MBLA), could represent a solution. Our objectives were to evaluate TB-MBLA as a biomarker in early bactericidal activity (EBA) studies and explore whether combining biomarkers with joint modelling could provide insight into underlying biological processes and reduce data loss.
Methods: We performed TB-MBLA (LifeArc) on sputum samples from all 78 patients from the BTZ-043 Phase Ib/IIa trial. We developed a probabilistic principal component analysis (pPCA)-based joint model of paired TB-MBLA, colony forming units (CFU) and time-to-positivity (TTP) data, and extracted the first principal component (PC1). With TB-MBLA alone and the PC1 marker we recapitulated the original stage IIa dose-response and stages Ib/IIa pharmacokinetics - pharmacodynamics (PK-PD) exposure-response models, applying linear and non-linear mixed models, respectively.
Results: In the stage IIa dose-response model, TB-MBLA alone indicated 500mg as the best performing arm, similar to TTP. In the stage Ib/IIa PK-PD analysis we could not detect an exposure-response effect, in contrast with CFU and TTP. When combining biomarkers, the stage IIa dose-response model of the PC1 marker identified 1000mg as the best arm - similar to CFU. In the stage Ib/IIa PK-PD analysis, we did observe evidence for an Emax exposure-response between days 0-3, and the model of the PC1 marker described the data well (Figure 1).

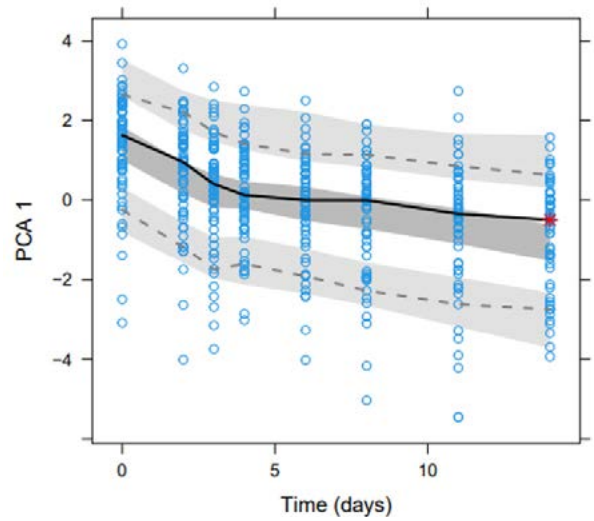

Figure 1. Visual predictive plot for PC1 PK-PD model using the $AUC_{0\text{-}24}$ $BTZ\text{-}043_{total}$.

Conclusions: Our PK-PD results in TB-MBLA offer new insights into the early temporal dynamics of BTZ-043 and its interaction with 16S ribosomal activity. We also successfully applied pPCA as a modelling framework, and showed that combined biomarkers may detect effects otherwise missed by single markers.

TBS-EP224 Optimizing the thresholds of the computer-aided detection for tuberculosis (CAD4TB) algorithms for tuberculosis screening in Mozambique

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Background: In Mozambique, despite rising incidence, TB screening and diagnosis remain challenging due to limited access to chest X-rays (CXR) and skilled radiologists. Computer-Aided Detection for Tuberculosis (CAD4TB), recommended by the WHO, offers a potential solution by automating CXR analysis.
However, the frequent software updates require constant evaluation. This study was conducted to assess the accuracy and optimal threshold of CAD4TB version 8, compared to earlier versions.
Design/Methods: We conducted a secondary data analysis of the National TB Prevalence Survey conducted in 2017. Participants ≥15 years, screened for TB symptoms, with CXR images and TB microbiological reference (Xpert MTB/RIF/culture) were included. CXRs were analysed using CAD4TB versions 5, 6, and 8.
Thresholds corresponding to 90% sensitivity were identified and compared. Receiver operating characteristic (ROC) curves were plotted to compare the accuracy of newer versus older versions and tested for significance. A subgroup analysis was conducted for people living with HIV.
Results: A total of 23.776 individuals were included in the analysis, of which 60 tested positive for TB. The 90% sensitivity threshold differed between versions: v5 and v6, v8. All versions did not show a significant difference between the algorithms in terms of AUC-ROC: CAD4TB v5 (0.96), v6 (0.96), and v8 (0.94) in the general population, as detailed in Figure 1.
Although CAD4TB v8 showed a higher AUC-ROC among individuals living with HIV (AUC v8: 0.98; v6: 0.96; v5: 0.90), the difference observed was not statistically significant (v5 vs. v8; *p-value* = 0.052).

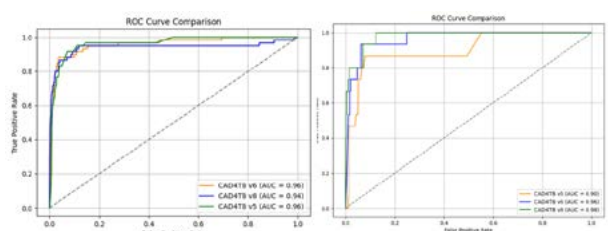

Figure 1: AUC-ROC for several CAD4TB versions in the general population (Left), people living with HIV (Right).

Conclusions: The updated versions of CAD4TB (v8) had comparable performance with their predecessors. This data also suggests that the new version can be used as a screening tool in high-risk populations where there is a lack of radiography experts.

TBS-EP227 Machine learning approach identifies distinct clinical phenotypes of HIV-associated pulmonary tuberculosis associated with differences in household transmission risk

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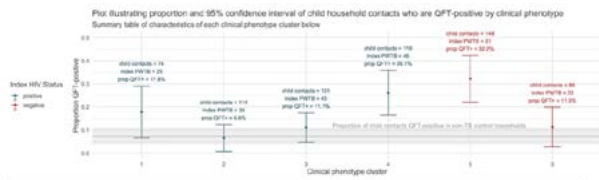
Background: Traditional classifications of pulmonary tuberculosis stratified by HIV status may over-generalise and miss heterogeneity in clinical phenotypes, which may be associated with differences in household transmission risk. This study investigates the association between machine learning-derived clinical phenotypes of pulmonary TB and household transmission risk in a high-HIV/TB burden context.
Methods: We recruited sputum-positive index PWTB (≥15 years) starting treatment at 12 health facilities in KwaZulu-Natal and measured QuantiFERON-TB Gold Plus (QFT) positivity among their child household contacts (2-14 years) as a proxy measure of household transmission risk. An unsupervised machine learning (ML) algorithm was used to decompose clinical, microbiological and radiological features of index PWTB into distinct phenotypes stratified by HIV status. The numbers of clusters for each HIV stratum was determined *a priori* (minimum cluster size ≥ 30).
We assessed the association between ML-derived clinical phenotypes and QFT-positivity in child contacts using a GEE logistic regression model.
Results: 291 index PWTB were included in the ML analysis, of whom 62% were people living with HIV (PLHIV). 4 distinct ML-derived phenotypes in PLHIV (clinical phenotype 1 – 4) and 2 distinct ML-derived phenotypes in HIV-negative PWTB (clinical phenotype 5 – 6)

were identified. Figure below includes a plot illustrating the proportion of child contacts QFT-positive by clinical phenotype and a summary table of characteristics of each clinical phenotype cluster. Note not all index PWTB contributing to ML analysis had a household visit to assess child contact QFT-status. Child contacts of clinical phenotypes 4 and 5 had a 5.0 and 6.7-fold higher odds of being QFT-positive compared to clinical phenotype 2 (p-value 0.003 and <0.001 respectively).



Cluster characteristics	Clinical phenotype 1	Clinical phenotype 2	Clinical phenotype 3	Clinical phenotype 4	Clinical phenotype 5	Clinical phenotype 6
HIV status	HIV+	HIV+	HIV+	HIV+	HIV-	HIV-
No. index PWTB per cluster	31	40	33	31	71	40
Percentage male	77%	29%	42%	47%	66%	52%
Median age (years)	32	39	51	35	38	47.50
Median BMI	20.10	26.10	24.60	20.20	20.10	23.65
Percentage with previous history of TB	16%	25%	51%	42%	3%	20%
Percentage reporting cough	90%	16%	79%	86%	63%	50%
Percentage reporting weight loss	90%	13%	63%	73%	57%	40%
Percentage reporting nights sweats/fever	94%	13%	69%	84%	63%	55%
Median CADHTB score	65	47	52	92	97	62.50
Percentage with cavitation on CXR	13%	2%	0	27%	48%	8%
Median Ultra Ct value (4 rpoB probes)	24.20	40	40	20.90	16.50	40
Percentage rpoBres confirmed	100%	23%	3%	100%	99%	17%
Percentage AKT client in last 3 months	94%	2%	9%	0	-	-
Median HIV VL log10copies/ml	4.43	0	0	0	-	-
Median CD4 count	137	508	620	201	-	-

Conclusion: A ML approach identified distinct TB phenotypes based on clinical, bacteriological and radiological data. Phenotypes with more radiological cavitation and higher bacillary burden were associated with a higher household transmission risk irrespective of HIV status.

TBS-EP230 A dual-CRISPRi system to probe gene-gene interactions in *M. tuberculosis*

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Mycobacterium tuberculosis, which causes human tuberculosis, remains one of the world's deadliest pathogens. The continual rise in drug resistant strains poses significant challenges for treatment and control, emphasising the urgent need for new drugs with novel targets, ideally with a high bar for evolution of resistance.
Paths to resistance against target-specific inhibitors could be revealed by gene-gene interactions, which constrain evolution at some genomic loci by requiring, for example, complementary mutations on a protein-protein interface. On the other hand, the extended network of genetic interactions can buffer the effects of loss-of-function, which may fuel evolution at other genomic loci. To better understand the target vulnerability spectrum in *M. tuberculosis*, anticipate resistance, reveal synthetic lethal gene pairs, and annotate new gene functions as pioneered in *Saccharomyces cerevisiae*, we aim to map genetic interdependencies and identify gene-gene interactions essential for mycobacterial survival.
To systematically probe gene-gene interactions in *M. tuberculosis*, we built on previous work by others, to develop a dual-CRISPRi/dCas9 system employing synthetic guide RNA scaffolds and synthetic promoters driving guide RNA expression to enable programmable titration of transcription of gene pairs independently in *M. tuberculosis*. Alongside, we optimised *M. tuberculosis* transformation efficiencies to enable dual-CRISPRi libraries of 10^6 clones per electroporation, whose multiplexed fitness can be determined using next-generation sequencing.
Having recapitulated known synthetic rescue pairs implicated in drug resistance, we are aiming to understand (i) the concordance between metabolic pathway topology and gene-gene interactions and (ii) the collateral sensitivity of evolved resistance emerging from loss-of-function of specific genes.
The resulting gene-gene interaction networks will also comprise a reference dataset to assist interpretation of data from PROSPECT a large-scale chemical-genetic interaction screening platform, to prioritise small molecules with new targets towards developing therapies with reduced selective pressures.

TBS-EP233 Differential responses of *Mycobacterium tuberculosis* complex lineages to tuberculosis treatment regimens

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Background: Tuberculosis (TB), caused by the *Mycobacterium tuberculosis* complex (MTBC), comprises ten lineages globally, all present in Africa. While some lineages, like Mtb lineages 2 and 4, are widespread, others, such as *M. africanum* (Maf lineages 5 and 6), are restricted to West Africa. Despite this diversity, drug-susceptible TB is treated uniformly with a six-month antibiotic regimen, ignoring lineage-specific variations that may affect outcomes. Addressing these differences is crucial for improving TB control.
Methods: We transformed drug-susceptible clinical isolates representing Africa's MTBC diversity with luminescence and green fluorescent protein reporter plasmids. These isolates were tested in a 20-day drug susceptibility assay to evaluate lineage-specific responses. Inhibitory

concentrations (ICs) for first-line, second line, and new anti-TB drugs were determined using the Collaborative Drug Discovery (CDD) Vault. Custom Python scripts identified optimal IC values and time points per lineage. These findings guided the evaluation of nine novel treatment regimens in clinical trials using checkerboard assays.

Results: IC measurements were most consistent between days 10 and 15 post-treatment across all lineages, with earlier or later time points showing variability. Notably, the IC50 of first-line drugs like rifampicin varied up to 4-fold between Mtb-lineage 4 and Maf-lineage 6.

Combination testing revealed significant differences in regimen efficacy from day 10, with day 20 as a robust benchmark. Trial1 (bedaquiline, linezolid and rifapentine), and Trial2 (bedaquiline, clofazimine and moxifloxacin) were less effective against Mtb-lineage 2, while SimpliciTB (bedaquiline, preteonamid, moxifloxacin and pyrazinamide) and Trial1 showed reduced activity against Mtb-lineage 4. For Maf-lineage 6, only End-TB (bedaquiline, moxifloxacin and pyrazinamide) and Trial1 outperformed the standard regimen, with all differences statistically significant.

Conclusion: MTBC lineage diversity significantly impacts anti-TB regimen efficacy. Some regimens showed enhanced efficacy against specific lineages, underscoring the potential of lineage-tailored treatments to shorten therapy and improve TB control outcomes.

TBS-EP239 The impact of phylogenetic lineages on the drug susceptibility of *Mycobacterium tuberculosis*

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Background: *Mycobacterium tuberculosis* complex can be classified into seven major phylogenetic lineages (L1-L7). Despite this diversity, most *M. tuberculosis* research has traditionally focused on H37Rv strain, and to a lesser extent Erdman strain, both belonging to L4. To reset this gap, Borrell *et al.* recently published a set of 20 genetically well-characterized clinical strains that represent all seven lineages (PMID:30908506).

Here, we aim to explore the impact of phylogenetic lineages on *M. tuberculosis* drug development by evaluating the susceptibility of classical anti-tuberculous drugs against the lineage reference set.

Results: Minimum inhibitory concentrations (MIC) of classical anti-tuberculous drugs were performed using a standardised protocol. Following EUCAST guidelines, only final bacterial inocula between 10^4 and 10^6 CFU/mL were accepted as valid.

Clinical strains exhibited a wide range of susceptibility profiles to the drugs tested. Moxifloxacin showed the most consistent MIC values (0.25mg/L) for all strains. In contrast, considerable variability was observed for most anti-tuberculous compounds, even within the same lineages.

L1 and L3 were associated with a tendency toward higher MIC for certain antibiotics, such as bedaquiline, pretomanid, isoniazid and ethambutol. General trends showed that the clinical strain set displayed MIC values equal or higher than those of H37Rv strain.

Furthermore, the use of different carbon sources influenced antimicrobial activity. Delamanid showed lower MIC values in cholesterol media, while ethambutol and rifampicin in fatty acid broth.

Conclusion: This work highlights that the use of the laboratory *M. tuberculosis* H37Rv strain and synthetic regular 7H9 media may not fully represent the clinical landscape, emphasizing the need for research with a wider range of strains from different lineages and carbon sources.

The lineage reference set could serve as a valuable tool for the initial screening of drug activity. However, establishing susceptibility trends associated with specific lineages would require a larger set of clinical strains.

TBS-EP242 The clinical potential of targeting the free fatty acid receptor 4 in COPD and asthma

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The free fatty acid receptor 4 (FFA4) has been implicated in the regulation of inflammation and FFA4 agonists have shown promise as therapeutic agents in reducing inflammation in preclinical studies. Asthma and COPD involve chronic inflammation, however the precise physiological role of FFA4 in the lung remain underexplored. Our aim is to profile the expression of the FFA4 receptor within the airway and explore the functional role of this receptor in a model of lung disease.

To profile the transcriptional landscape of the FFA4 receptor in the lung, hybridisation chain reaction followed by smFISH was performed on 10 μm FFPE lung sections from FFA4-HA and FFA4-KO mice. To analyse FFA4 protein expression, lungs from FFA4-HA and FFA4-KO mice underwent Western blot analysis performed utilising an antibody against the HA-epitope tag. To examine

the functional role of FFA4 in the lung, 100 μM carbachol was administered onto precision cut lung slices (PCLS) from wildtype, FFA4-HA, and FFA4-KO mice to cause bronchoconstriction, then 100 μM of the FFA4 agonist TUG-891 was added to the lung slices. The resulting changes in airway diameter were imaged using the eVOS microscope.

Our findings demonstrate that FFA4 is expressed in the lung and plays a role in airway relaxation. Spatial transcriptomic analysis revealed that FFA4 is transcribed throughout the airway and also detected at the protein level in the lung. The PCLS model demonstrated significant contraction of the airway lumen following carbachol treatment in all three mouse lines ($P<0.0001$, two-way ANOVA; n=6), however only the wildtype and FFA4-HA mouse lines gave significant airway relaxation following treatment with TUG-891 ($P<0.05$, two-way ANOVA; n=6), indicating an FFA4-specific effect.

These data reveal the expression of the FFA4 receptor in the airway and provide evidence of its function in airway relaxation, providing a therapeutic target for lung diseases involving bronchoconstriction.

TBS-EP245 Evaluation of locally synthesized silica-coated magnetic nanoparticles for development of a *Mycobacterium tuberculosis* DNA concentration assay

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Tuberculosis (TB), especially with the rise of multidrug resistant TB (MDR-TB), has prompted intensified efforts to develop point-of-care testing (POCT). While most molecular diagnostics tools focus on simplifying gene amplification and detection of MDR-TB specific mutations, the limit of detection of these assays depends on efficiency and portability of the DNA concentration method. In this context, magnetic nanoparticles (MNPs) offer advantages for rapid and efficient DNA extraction in limited resource settings.

Our goal was to develop a Magnetic Nanoparticle-based DNA concentration workflow capable of yielding sufficient TB DNA from sputum samples that can be used for subsequent downstream applications. For this, iron oxide MNPs modified with silica coating (Si-MNPs) were locally synthesized. Using *Mycobacterium smegmatis* with known concentration as test samples, the DNA extraction performance of Si-MNPs (50, 100, 150, 200, and 250 mg/mL) and one commercial magnet-based kit was compared.

Three extraction runs using 10^5 CFU/mL of *M. smegmatis* and one extraction run with lower bacterial concentrations (10^4-10^1 CFU/mL) were conducted. Then, the concentration of DNA extracts was measured using a Qubit fluorometer and relative quantities were assessed by quantitative PCR targeting the 465 bp 16S rRNA of *M. smegmatis*.

TABLE 1. Qubit measurements of DNA extracts (Average DNA concentration in ng/mL) obtained from different concentrations (CFU/mL) of *M. smegmatis*.

Magnetic Nanoparticle	10^5 CFU/mL	10^4 CFU/mL	10^3 CFU/mL	10^2 CFU/mL	10^1 CFU/mL
Commercial MNPs	2.44 ± 0.54	2.7 ± 1.17	2.85 ± 0.8	2.77 ± 0.8	1.99 ± 0.27
50 mg/mL Si-MNPs	2.26 ± 0.54	1.83 ± 0.79	0.99 ± 0.33	1.28 ± 0.4	1.72 ± 0.97
100 mg/mL Si-MNPs	2.48 ± 0.27	0.77 ± 0.01	0.69 ± 0.11**	< 0.50 ± 0***	< 0.50 ± 0***
150 mg/mL Si-MNPs	2.64 ± 0.47	1.28 ± 0.66	0.65 ± 0.05**	0.71 ± 0.21*	0.57 ± 0.01**
200 mg/mL Si-MNPs	2.97 ± 0.41	0.88 ± 0.02**	< 0.50 ± 0***	0.69 ± 0.15*	0.60 ± 0.01**
250 mg/mL Si-MNPs	4.91 ± 1.31	1.34 ± 0.03	1.73 ± 0.83	1.59 ± 0.68	1.27 ± 0.5

NOTE: Three extraction runs using 10^5 CFU/mL of *M. smegmatis* and one extraction run of lower bacterial concentrations (10^4-10^1 CFU/mL) were conducted. For each extraction run, the six extraction protocols with varying MNPs (5 concentration of Si-MNPs and 1 commercial kit) were tested in triplicates. Asterisks (*, **, ***) denote the number of replicates that yielded a Qubit reading of "too low" (< 0.50 ng/mL).

For runs utilizing 10^5 CFU/mL, the 250 mg/mL Si-MNPs obtained the lowest average Cq value from qPCR (18.40). As shown in Table 1, Qubit measurements also revealed that there was a significant difference (p value < 0.001) across the protocols tested wherein the average DNA yield of 250 mg/mL Si-MNPs was significantly higher than that of 50-200 mg/mL Si-MNPs and the commercial kit.

Moreover, consistent and successful DNA extraction was observed using 250 mg/mL Si-MNPs even at 10^1 CFU/mL. With the potential for portability of MNPs, these results serve as a foundation towards development of DNA concentration method that can be coupled with POCT of MDR-TB.

TBS-EP248 A multiplex Mtb-specific FluoroSpot assay measuring IFNγ, TNF, and IL2-secreting cells can improve accuracy and differentiation across the tuberculosis spectrum

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Introduction: Diagnostic tests to differentiate within the TB infection (TBI) spectrum are needed to improve diagnostic precision and to identify individuals with an increased risk of TB disease (TBD) progression.
Methods: FluoroSpot (Mabtech™) uses fluorescence-labeled antibodies detecting up to four cytokines from individual cells, i.e. "spots".
We evaluated a multiplex IFNγ,TNF,IL2 FluoroSpot assay and compared it to a standard IFNγ ELISpot following overnight incubation with *Mtb* antigens ESAT-6, CFP-10, and EspC.
Results: In a cohort of 114 individuals (TBD=24, TBI=63, IGRA- controls=27) FluoroSpot and ELISpot showed a good agreement for IFNγ detection, with spot forming units (SFUs) highly correlated (r^2=0.72, p<0.001).
Triple IFNγ/IL2/TNF+ cells (i.e. all three cytokines detected in one SFU), total IFNγ, and total IL2 had the highest positivity rate in both TBD (88%) and TBI (81-84%). Higher specificity for IFNγ/IL2/TNF resulted in higher Area-under-the-curve (AUC) than for IFNγ in both TBD (0.91 vs 0.87) and TBI (0.90 vs 0.87) compared to controls.

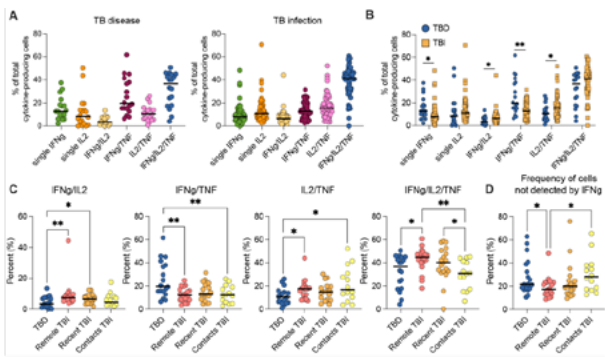

*Figure 1. Frequency of single, double and triple cytokine-producing cells after stimulation with Mtb antigens ESAT-6, CFP-10 and EspC. **A and B)** TB Disease (TBD) (n=18) and TB infection (TBI) (n=53). Comparisons using Mann-Whitney test. **C and D)** TBD (n=18) and TBI grouped by time since exposure: remote TBI; >2 years (n=20), recent TBI; 6 months to 2 years (n=19) and TB contacts; <6 months (n=14). Comparisons using a Kruskal-Wallis test followed by uncorrected Dunn's test. *p<0.05, **p<0.01*

Across the TB spectrum, non IFNγ+ cells constituted 17-28% of *Mtb* specific cells. Triple IFNγ/IL2/TNF+ cells were the most common celltype in individuals with TBD and TBI alike. The proportions of double IFNγ/IL2+ and IL2/TNF+ cells were higher in TBI (both p<0.05), with more single IFNγ+ (p<0.05) and double IFNγ/TNF+ (p<0.01) cells in TBD.
Furthermore, we detected differences within the TBI group; TB contacts with a recently aquired TBI (<6 months) had lower proportion of IFNγ/IL2/TNF+ cells compared to those with a long-standing TBI. By contrast, IFNγ/IL2+ cells were more abundant in TBI (>6 months) when compared to TBD.
Conclusion: Adding IL2 and TNF improved detection of TB specific immune responses compared to IFNγ alone. Distinct cytokine profiles associated with different stages of the TB spectrum merit further exploration and could be used for risk stratification in TBI, while providing clues to T-cell differentiation.

TBS-EP251 Clinical evaluation of the LifeArc Tuberculosis Molecular Bacterial Load Assay (TB-MBLA) for the diagnosis and monitoring of pulmonary tuberculosis

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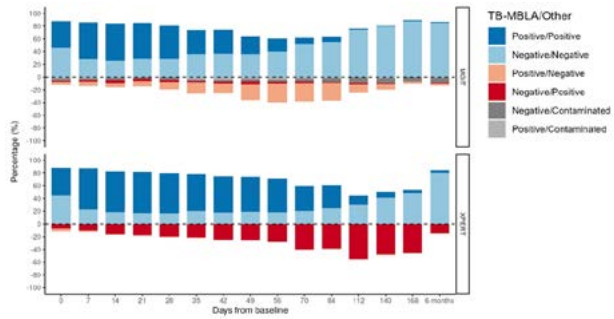
Drug-resistant TB is a major contributor to antimicrobial resistance and antimicrobial stewardship is hindered by the lack of reliable TB treatment monitoring tools. Limitations of culture include long time-to-result (>6 weeks), low sensitivity, and contamination risks. The LifeArc TB-MBLA offers several advantages by quantifying *Mycobacterium tuberculosis* (MTB) in <24h with improved sensitivity and specificity. TIME (**T**B D**i**agnosis and **M**onitoring **E**valuation)-a multi-centred, longitudinal, prospective study- evaluated the performance of LifeArc TB-MBLA for the detection and monitoring of pulmonary tuberculosis in the sputum of symptomatic adults. Participants were evaluated in comparison with MGIT (Mycobacteria Growth Indicator Tube) culture and Xpert MTB/RIF Ultra (molecular DNA test). Performance was evaluated against a compositive reference standard of 'MGIT plus clinical diagnosis'. Bacteriologically positive participants with a positive clinical diagnosis attended 13 monitoring visits during standard anti-TB treatment, followed by one visit 6-months later.

Of 514 participants, 255 were TB-positive, 180 TB-negative, and 107 unconfirmed TB (but prescribed treatment). TB-MBLA demonstrated high specificity (≥98%) for ruling out TB and strong sensitivity (≥80%) for detecting TB. Participants with unconfirmed TB had TB-MBLA readings comparable to TB-negative participants, suggesting inappropriate stewardship of antibiotics. TB-MBLA demonstrated strong concordance with culture in detecting viable bacilli, though concordance reduced slightly during treatment as bacterial load decreased and the limits of culture sensitivity are realised. Before treatment, TB-MBLA showed strong/moderate concordance with Xpert, but this declined during treatment in part due to persisting DNA from non-viable bacilli.

The stronger concordance of TB-MBLA with culture, compared to Xpert, supports its utility as a surrogate biomarker of viable bacilli by quantifying MTB 16S rRNA (Figure).



TB-MBLA is uniquely positioned to meet the unmet need for real-time TB treatment monitoring. TIME study validated its utility as a monitoring tool and highlighted its potential to replace culture in both clinical trials and routine care.

TBS-EP254 The diagnostic value of interferon-γ and IP-10 in latent and active tuberculosis: A comparative analysis

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Introduction: Tuberculosis (TB) remains a major global health challenge, with difficulties in diagnosing latent TB infection (LTBI). The Interferon-Gamma Release Assay (IGRA) is widely used but has limitations, particularly in immunocompromised patients and in distinguishing TB stages. Interferon gamma induced protein (IP-10), an immunomodulatory cytokine, may influence TB diagnosis by affecting immune responses. This study investigates whether IP-10 can serve as a complementary biomarker alongside interferon gamma.

Methodology: Between January 1 and March 31, 2025, blood samples from 198 patients (mean age 41.66, male-predominant) with either LTBI or active TB were collected. IP-10 levels were measured via ELISA (RIDASCREEN®TB), and Interferon-γ responses were assessed using QuantiFERON®-TB Gold Plus. Patients were categorized into immunocompromised and active TB groups. Statistical analysis included McNemar's test to compare test performance.

Results:

- IGRA was positive in 20.48% overall, 53.12% of active TB cases.
- IP-10 was positive in 28.9% overall, 71.87% of active TB cases.
- Concordant positivity (both tests) was seen in 28 immunocompromised cases (9%).
- Discordance: 4 IGRA+/IP-10– and 5 IGRA–/IP-10+ cases.
- Indeterminate IGRA results were higher (29.2%) than IP-10 (18%).
- McNemar's test showed no significant difference in positivity rates between the assays in either group ($p > 0.05$), though IP-10 trended higher in active TB.

Conclusion: Interferon-γ and IP-10 demonstrated comparable diagnostic performance. IP-10 showed a non-significant trend toward higher sensitivity in active TB and yielded fewer indeterminate results, suggesting it may be a useful adjunct in TB diagnosis, especially in immunocompromised patients or when IGRA results are inconclusive.

TBS-EP257 Estimating the national transmission impact of household contact management and tuberculosis preventive treatment for drug-susceptible and multidrug-resistant tuberculosis in South Africa

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Background: Multidrug-resistant (MDR) tuberculosis (TB) presents a major threat to the End TB Strategy, with 150,000 people dying of MDR-TB in 2023 alone. The household remains an important source of transmission, which can be addressed through household contact management (HHCM) and providing TB preventive

treatment (TPT) to individuals at high risk. Recent trials have shown the effectiveness of providing levofloxacin as TPT to prevent MDR-TB disease in high-risk household contacts, leading to WHO guideline recommendations in 2024 for TPT for those exposed to MDR-TB. However, HHCM and TPT coverage remains low, and the wider impact on transmission beyond the household is unknown.

Methods: We developed a novel transmission model of the South African TB epidemic, that represents household TB status, to estimate the impact of implementing HHCM and TPT for drug-susceptible (DS) TB and MDR-TB between 2025 and 2030. We compared the impact of 1) providing HHCM to household contacts of 50% of people with diagnosed infectious pulmonary TB, 2) providing both HHCM and TPT (for individuals at risk of either DS-TB or MDR-TB) to 50% of household contacts, 3) implementation of both HHCM and TPT to 100% of household contacts, against a baseline scenario with no HHCM or TPT.

Results: Compared to the baseline scenario, 50% coverage of HHCM could prevent 48,200 (7.7%) people from developing TB and 2,600 (1.3%) TB deaths over the first five years. Addition of TPT would modestly increase these benefits, whilst widening both HHCM and TPT to all contacts could prevent a total of 102,800 (16.4%) of disease episodes and 6,800 (3.5%) deaths. There were only small differences in the impact on DS-TB compared to MDR-TB.

Scenario	TB deaths	TB deaths prevented	Incident TB	Incident TB prevented	Incident DS-TB prevented	Incident MDR-TB prevented
Baseline	192,300	-	626,400	-	-	-
50% HHCM	189,700	2,600 (1.3%)	578,200	48,200 (7.7%)	7.8%	7.3%
50% HHCM & TPT	189,000	3,300 (1.7%)	577,500	48,900 (7.8%)	7.9%	7.5%
100% HHCM & TPT	185,500	6,800 (3.5%)	523,600	102,800 (16.4%)	16.6%	15.2%

DS-TB: drug-susceptible TB; MDR: multidrug-resistant TB; HHCM: household contact management; TB: tuberculosis; TPT: TB preventive treatment

Table 1: Impact of household contact management and TB preventive treatment on TB deaths and incident TB in South Africa between 2025 and 2030.

Conclusion: Widespread implementation in South Africa of HHCM and TPT for DS-TB and MDR-TB amongst household contacts could prevent a substantial proportion of incident TB and TB deaths.

TBS-EP260 Comparative transcriptomics uncover the mechanisms of transcripts regulation by coding and non-coding RNAs within the *Mycobacterium tuberculosis* complex strains

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Tuberculosis is caused by the *Mycobacterium tuberculosis* complex (MTBC), a group of closely related pathogens infecting humans and animals globally. Although molecular mechanisms of pathogenesis remain unclear across diverse strains, next-generation sequencing offers powerful means to explore MTBC regulatory networks and their disease roles.

Drug-susceptible clinical MTBC strains from lineages 1 through 8, isolated from geographically diverse regions, were selected alongside virulent and avirulent laboratory controls (H37Rv and H37Ra).

These strains were cultured in Middlebrook 7H9 broth and minimal media supplemented with cholesterol to simulate a host-like cholesterol-rich environment. Total RNA was extracted and subjected to deep RNA-sequencing, generating approximately 100 million reads per sample using the Illumina NovaSeq 6000 platform.

Differential gene expression was assessed by comparing transcriptomic profiles of strains grown in 7H9 versus cholesterol media using the *Hisat2*, *Stringtie,* and *DESeq2* bioinformatics tools.

Functional annotation and biological pathway analysis were conducted using Gene Ontology (GO) terms and KEGG pathway enrichment to determine the molecular functions, cellular components, and biological processes associated with differentially expressed transcripts across MTBC lineages. Our findings revealed differential regulation of coding (~1500) and non-coding RNA transcripts (~400) among the MTBC strains.

Comparative analysis identified distinct transcriptional profiles among the 8 lineages compared to the H37Rv and H37Ra controls. Several antisense RNAs overlapping virulence genes were differentially expressed, suggesting a potential role in fine-tuning virulence factors.

Functional enrichment analysis revealed significant representation of GO terms related to lipid metabolic process, response to stress, and regulation of transcription. Notably, both coding and ncRNA were implicated in cholesterol metabolism, a critical pathway for intracellular survival of the MTBC. Although ncRNAs have been identified in *M. tuberculosis*, their regulatory roles across

MTBC lineages remain unclear. Our study reveals lineage-specific RNA regulation in cholesterol, uncovering key pathways in pathogenesis that offer promising targets for novel TB therapeutics.

TBS-EP263 Tongue and rectal swab samples processed by manual qPCR enhance clinical decision-making in paediatric patients with presumptive tuberculosis

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Background: Initiation of chemotherapy in young children with presumptive tuberculosis (TB) is commonly preceded by standard of care (SOC) procedures that include clinical and radiological assessments supplemented by laboratory tests for detection of Mycobacterium tuberculosis. In this study, tongue and rectal swab sample types for manual qPCR processing were investigated as potential additional options to inform clinical decision for initiating treatment in paediatric TB.
Design/Methods: Forty-five children (<5 years old) with signs/symptoms of TB (cough, fever, failure to thrive, lethargy) were admitted to a tertiary care facility (Kalafong Hospital) in Pretoria, South Africa. SOC assessments over 3 days included clinical evaluation, determining HIV status, chest x-ray and gastric aspirate/sputum collections for smear microscopy and molecular diagnostic assay (GeneXpert/Cobas). In patients with HIV, urine LAM testing was also performed. For study purposes, tongue and rectal flocked swab samples were collected daily into PrimeStore Molecular Transport Medium (PS-MTM) for batched manual qPCR processing (Quantstudio 5). PS-MTM samples remain stable without refrigeration and are rapidly rendered noninfectious. The decision to initiate TB treatment was based on SOC assessments, clinicians were blinded to the swab results.
Results: SOC procedures led to 10 of the 45 patients being initiated on anti-TB chemotherapy, predominantly based on clinical presentation, chest x-ray and HIV status. In all cases, gastric aspirates/sputum returned negative laboratory results. A combined total of 16 qPCR positive results from oral swabs (11/45) and rectal swabs (5/43) were obtained. Only 2 of the 16 patients with positive qPCR were initiated on anti-TB treatment on the basis of the SOC assessment.

Patient information	
Age (months) (n=45) / Gender distribution (n=42)	Mean: 21,5; SD: 12,8; Range: 02-58 / M: 18/42 (42,9%); F: 24/42 (57,1%)
Clinical and diagnostic	
TB treatment initiated (SOC)	10/45 (22,2%)
Patients with lower respiratory tract infections or pneumonia	14/42 (33,3%); 9/14 presented with abnormal chest x-ray, of whom 3 were initiated on TB treatment
Patients with HIV	7/39 (17,9%)
Gastric aspirate (smear microscopy, GeneXpert, Cobas)	All negative
Swab PCR results	
Tongue or rectal swab qPCR positive	16/45 (35,6%); 13/16 had CXR results of which 7 (53,8%) showed abnormalities

Table 1. Patient population and TB diagnostic yield from qPCR tongue/rectal swab processing by qPCR.

Conclusions: Tongue and rectal swab samples collected serially from infants and young children with presumptive TB and batch processed by manual qPCR enable the detection of TB in a significant proportion of paediatric patients regarded as not eligible for anti-TB treatment by SOC protocols.

TBS-EP266 Mutational profiling and phylogenetic analysis of *Mycobacterium tuberculosis* strains from Pakistan

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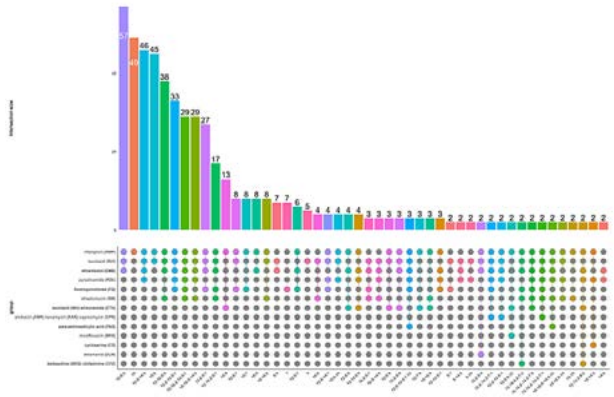
Pakistan ranks 5th among the high tuberculosis (TB) burden nations.Only limited information is available on mutation profiles, and population structure of *M. tuberculosis* complex (Mtbc) strains based on high resolution whole genome sequencing (WGS) data. To address this knowledge gap, we performed a retrospective WGS study across Sindh province of Pakistan using 600 primarily drug resistant Mtbc strains collected in years 2015-2023 at Indus Hospital & Health Network, Karachi. Briefly, DNA was extracted from MTB strains followed by WGS using illumine NextSeq 2000. Mtbc lineages and genotypic resistance profiles were determined via MTBseq.
Of the 600 MTB isolates, 46.5% were MDR, while 24% were pre-XDR, and 0.7% XDR. Overall, rifampicin (RIF) resistance was most frequent (85% isolates), followed by resistance to isoniazid (INH) (79%) and ethambutol (EMB) (61%). Among the 512 RIF resistant Mtbc strains, 35% (n=177) were pre-XDR and 1.5% (n=8) were resistant to either delamanid and/or bedaquiline. When resistance combinations are considered, combined RIF, INH, and EMB was found to be most common followed by

mono resistance to RIF, and combined resistance to the four first line drugs. The most frequently mutated genes included *rpoB* (S450L) for RIF, and *katG* (S315T) and *inhA* (I194T and I21V) for INH, *gyrA* (D94G and A90V) and *gyrB* (A504V) for FQ. Lineage 3 was most common (66%), followed by lineage 1(12%) and 4(12%), and few cases of lineage 2 (4.7%). Interestingly there was one strains classified as *M. bovis*.



In conclusion, our data show a high rate of FQ resistance among RR Mtbc strains of the study population. Still, resistance to other group A drugs such as bedaquiline, is infrequent.The future development needs to be thoroughly monitored as the high rate of FQ resistance may path the way for rapid development of bedaquiline resistance as observed in other regions of the world.

TBS-EP269 Using affinity proteomics to understand the host response and identify diagnostic signatures of TB infection and disease

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Non-sputum-based biomarkers for early diagnosis of TB disease are urgently needed to control transmission and achieve the World Health Organizations goals of ending TB. Host derived proteins, such as cytokines and acute-phase proteins are important mediators in controlling pathogen-specific responses. The pattern of these proteins can be informative in understanding the underlying disease biology and biomarkers can be identified that correlate with infection or disease status.
In this study, we have used the Olink proximity extension assay (PEA) to assess 5400 protein in 92 human donors. These donors included individuals with different types and severity of TB disease (n=27) and individuals with Recent (< 2 years, n=22) or Remote (> 2 years, n=25) TB infection and IGRA– controls (n=18). Using network-based analysis we could identify modules specific for the different groups which upon Gene Ontology analysis indicated activation of different biological pathways.
In addition to this exploratory study, we previously identified a 12-marker plasma protein signature associated with TB disease severity when measuring 92 inflammation-associated proteins with the Olink PEA. We have now validated the signature's performance in identifying TB disease in independent Swedish and Italian cohorts, including individuals with TB infection and other respiratory diseases (total n=317 samples from 273 donors).
We condensed the 12 proteins to smaller 6 (CDCP1, VEGFA, IFN-g, CXCL9, IL6 and MCP-3) and 4 (CDCP1, VEGFA, IFN-g, CXCL9)-protein signatures which remained highly enriched and even improved accuracy when compared with ten other published protein signatures for TB disease. Sensitivity in TB disease compared with TB-infection was 89% in the entire cohort and 97% in the Italian cohort, with specificity fixed at 70%.
We further confirmed that the signatures perform well in both heparin and EDTA plasma. These studies highlight the value of investigating host protein responses for biological and diagnostic insights in TB research.

TBS-EP272 Evaluation of the WHO Mutation Catalogue (second edition) for genomic characterization of bedaquiline-, pretomanid- and linezolid-resistant *M. tuberculosis* isolates in South Africa

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Background: The second edition of the WHO Mutation Catalogue, published in 2023, serves as the global reference for interpreting mutations associated with resistance to TB drugs. A key feature of this edition is the inclusion of mutations associated with bedaquiline (BDQ), pretomanid (Pa) and linezolid (LZD) resistance. Given its integration with WHO-endorsed next generation sequencing assays, we sought to evaluate the catalogue in characterising isolates resistant to BDQ, Pa and LZD.

Methods: A total of 339 *M. tuberculosis* isolates, collected from four referral laboratories across South Africa and displaying phenotypic resistance to BDQ, Pa or LZD, were included. Minimum inhibitory concentration (MIC) testing using MGIT 960 was performed for each drug at four concentrations above, below and at the WHO recommended critical concentration (CC).
Whole genome sequencing (WGS) was performed using the Illumina NextSeq 1000 platform and variant analysis performed on CLC Genomics Workbench. The WHO Mutation Catalogue was applied to assign mutation gradings for all associated genetic targets.
Results: The agreement between MICs and mutations graded as either associated or not associated with resistance was 94.2% for BDQ, 95.3% for Pa and 99.2% for LZD. False BDQ resistance was observed in isolates harbouring resistance mutations and displayed MICs bordering the CC; and false Pa susceptibility observed in wild-type isolates displaying MICs above the CC excluding lineage 1.
Overlap between MICs was observed for uncertain significance mutations associated with BDQ and Pa. Uncertain significance and ungraded mutations for LZD were associated exclusively with low-level LZD MICs. Two BDQ ungraded isolates harboured the *Rv0678* Leu154Pro mutation and displayed BDQ MICs of 8.0µg/mL.

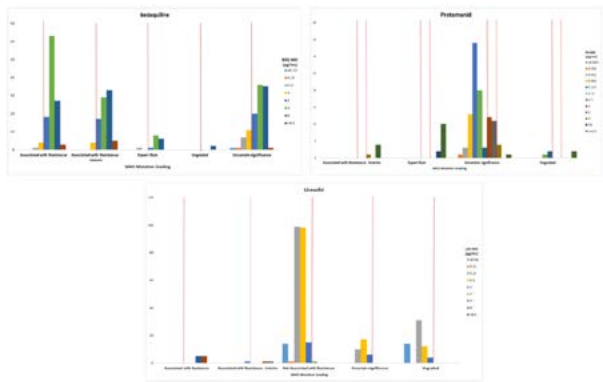

Figure: Distribution of MICs and associated WHO mutation gradings. The red line represents the WHO-recommended critical concentration for each drug.

Conclusions: The WHO Mutation Catalogue (second edition) shows good performance in classifying graded mutations. Our findings underscore the importance of continuous global contribution to updates of the catalogue, ensuring resistance conferring mutations are represented and improving overall susceptibility calls.

TBS-EP275 Assessing diagnostic delays in tuberculosis testing: Turnaround time from computer-aided diagnostic X-ray to GeneXpert in selected Ugandan health facilities

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Background: Getting a quick diagnosis for tuberculosis (TB), including drug-resistant TB (DR-TB), is vital in places like Uganda where TB is widespread. We used digital chest X-rays with computer-aided diagnostic (CAD) systems as the first step, followed directly by GeneXpert to confirm TB and check for rifampicin resistance. Delays in this process could slow down treatment initiation and affect patients.
Our study looked at how long it took to go from CAD X-ray to GeneXpert results, focusing on DR-TB cases and school-going children.
Methods: We ran a retrospective study with data from 13,823 digital chest X-ray images, including 1,934 from school-going children, collected at UCMB-affiliated health facilities in Uganda from January 2024 to June 2025. We focused on patients with positive GeneXpert results (confirmed TB) and calculated the turnaround time (TAT) as the days between CAD X-ray analysis and GeneXpert result.
We used basic stats like mean, median, and range, and broke down TAT by rifampicin resistance (DR-TB vs. drug-susceptible TB), age (children vs. adults), and facility type. We secured ethical approval and anonymized all data to protect patient privacy.
Results: From the 13,823 cases, including 1,934 kids, we estimated an average TAT of about 2–5 days. School-going children often had faster results, likely around 1–3 days, thanks to prioritized CAD screening in school programs and quick GeneXpert follow-up. DR-TB cases, where rifampicin resistance was detected, took slightly longer, around 3–5 days, likely due to extra steps in confirming resistance. TAT varied by facility, reflecting differences in CAD integration and lab capacity.
Conclusion: Our study showed that the CAD X-ray-to-GeneXpert pathway for TB and DR-TB diagnosis is efficient, especially for kids in school programs. These findings will help guide efforts to make TB diagnosis even faster and improve care in Uganda.

TBS-EP278 Real-time predictive modelling for TB hotspots at the barangay level in the Philippines

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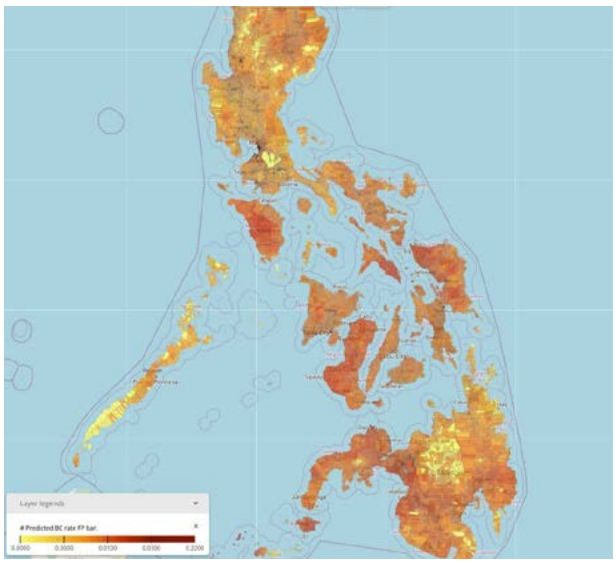
Background: Despite ongoing control efforts, tuberculosis (TB) remains unevenly distributed across Philippine communities. To enable precise, data-driven targeting, we built a real-time predictive model that combines geospatial context with Active Case Finding (ACF) data to forecast TB risk at barangay level - the smallest admin unit in the Philippines.
Feature Development: We incorporated retrospective ACF outcomes with geospatial datasets, including: population density; access to clean water; open defecation; childhood vaccination; female literacy; satellite-derived nightlights; travel times to the nearest health facility; relative wealth index; child stunting and under-five mortality; road networks; and leveraging self-organizing map (SOM) encodings for population distribution, proximity to health services, land type, and indigenous status.



Model Training: We aggregated all data at the barangay level (n ≈ 42 000) and evaluated three classifiers—Naive Bayes (NB), Random Forest (RF), and XGBoost—using province-level cross-validation. In each fold, entire provinces were held out from training. We used Relative Risk Increase (RRI)—the ratio of TB yield in the top 30 % predicted hotspots versus the bottom 70 %—to compare models. Under these conditions, NB achieved RRI = 0.4785, indicating a 48 % higher TB yield in predicted hotspots. XGBoost and RF underperformed, with RRI = 0.0775 and RRI = 0.0085, respectively. When predicting the rates of people living with all-forms TB, Naive Bayes achieved RRI = 1.0101, XGBoost RRI = 0.4911, and Random Forest RRI = 0.7317.
Deployment and Impact: The NB models were retrained on the full dataset and embedded into the Epi-Control geoportal. Health workers can now access risk maps, filter by key covariates, and rank Barangays for targeted ACF campaigns. By directly predicting at the barangay scale this framework transforms ACF data into actionable insights, enabling stakeholders to concentrate resources on the most vulnerable communities to accelerate finding people living with TB.

TBS-EP281 *Mycobacterium tuberculosis* curli pili (MTP) and heparin-binding haemagglutinin adhesin (HBHA) in combination modulate central carbon metabolism of the pathogen *in vitro*

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Tuberculosis (TB) remains the global leading infectious cause of death. A deeper understanding of *Mycobacterium tuberculosis* (*Mtb*) virulence factors associated with pathogenesis is crucial for the improvement of current TB control strategies. *Mtb* encodes a plethora of surface adhesins which aid in its pathogenicity.
Of these, the *Mtb* curli pili (MTP) and heparin-binding haemagglutinin adhesin (HBHA) have been reported as suitable targets for TB diagnostics/intervention strategies. Although regarded as adhesins, previous "omics" studies highlighted the role of HBHA and MTP-HBHA in modulation of *Mtb* central carbon metabolism (CCM).
However, their precise contribution to *Mtb* metabolism remain unknown. Therefore, this study examined the impact of these adhesins on the bioenergetic profile and metabolic flux of *Mtb* using extracellular flux analysis, ^{13}C-isotopomer analysis, and *Mtb hbhA* and *mtp-hbhA* proficient and deficient strains.
The findings demonstrated that HBHA and MTP-HBHA decreases bacterial respiration and CCM, potentially aiding in *Mtb's* survival. The presence of HBHA resulted in increased glycolytic flux and decreased flux through the pentose phosphate pathway (PPP), glycerolipid metabolism, and tricarboxylic acid cycle (TCA).
The absence of MTP-HBHA resulted in the rerouting of carbons from PPP and glycerolipid metabolism toward glycolysis and the TCA cycle. Thereafter, RNA was extracted from the bacterial broth cultures of the adhesin/s-

proficient and deficient strains to determine the expression levels of genes associated with CCM and dormancy. The *hbhA* and *mtp-hbhA* induced increased expression of dormancy-linked genes (*devR*, *devS*, *dosT*, *moaA1*, and *moeX*) and amino acids linked to the TCA cycle (*serA2*, *icd1*, *ilvC*, and *trpD*), thereby potentially aiding in the survival, replication, and virulence of *Mtb*.
These findings support the growing evidence that HBHA and MTP significantly contribute to the pathogenicity of *Mtb,* and emphasizes the combined use of both MTP and HBHA, as a prominent dual-adhesin biomarker for TB diagnostics, vaccine development, and therapeutics.

TBS-EP284 The use of chest X-ray computer-aided detection scores in assessing post-TB lung disease in children

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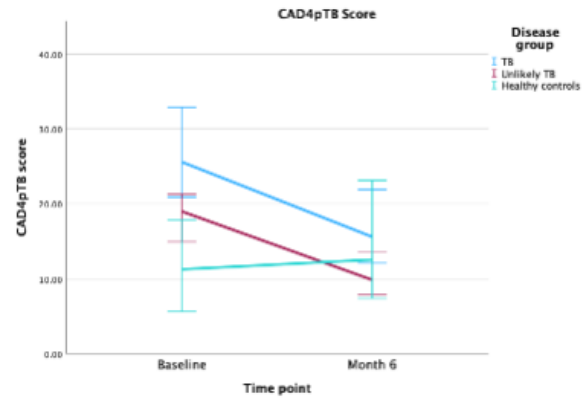
Background: Computer-aided detection (CAD) software is being refined to support the diagnosis of pulmonary tuberculosis (PTB) in children. We aimed to investigate an association between CAD scores at diagnosis and changes after 6-months in children with presumptive PTB using adapted paediatric TB CAD software.
Methods: We analysed chest x-rays (CXRs) from children aged 0-13 years who were enrolled in the Umoya TB diagnostic study in Cape Town, South Africa. CXRs at baseline and after 6-months of treatment were read by a blinded TB expert and classified as typical or not-typical for TB. CXR images were processed by the CAD4TBpTBv7 (CAD4TBv7 software retrained with paediatric images). CAD scores were compared between children with TB, non-TB respiratory illnesses (non-TB RI) and healthy controls. CXR features were assessed for any association with reduction (≥20 points) in CAD scores using binary logistic regression.
Results: There were 233 children with TB, 267 with non-TB RI and 34 healthy controls, with a median age 25.4 months (IQR 11.5; 53.5), 255 (50%) female and 46 (9%) living with HIV. At baseline, children with TB had significantly higher CAD scores compared to children with non-TB RI (p<0.00;1 Figure 1).
Children with TB who had volume loss noted on baseline CXRs were 11.63 (95% CI 1.35; 100; p=0.01) times less likely to have a ≥20 point CAD4pTB score reduction, whereas the presence of enlarged lymph nodes, pleural effusions and opacifications had no effect on the likelihood of a CAD score reduction.



Conclusion: Our findings show that CAD scores from children with TB and non-TB RIs decrease over time, suggesting good radiological improvement in most children. A poor radiological response may assist in identifying children at risk for post-TB lung disease. These results highlight the need for further development of CAD tools for paediatric TB and post-TB lung disease assessment.

TBS-EP287 The accuracy of an infrasound vibroacoustic signature to screen for tuberculosis disease

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Background: Accurate, easy-to-use tuberculosis (TB) screening tests are needed to aid case finding in high TB burden areas. We assessed the accuracy of a "vibroacoustic" signature, collected using a point-of-care electronic stethoscope, to detect TB disease.
Methods: From March 2022 through February 2024, people ≥12 years with presumptive TB were consecutively enrolled at outpatient health centers in India, the Philip-

pines, South Africa, Uganda, and Vietnam. Participants provided sputum for TB testing (Xpert MTB/RIF Ultra x1 and liquid culture x2). We used the imPulse® UNA full spectrum electronic stethoscope to record subaudible vibrations at six different chest sites for 30 seconds each (3 minutes total). We trained, validated, and blind-tested an autoencoder-transformer hybrid AI model to determine the accuracy of a vibroacoustic signature to detect microbiologically confirmed TB.

Results: Vibroacoustic data was collected from 2,642 participants, among whom median age was 41 years (IQR 29-55), 48.5% were female, 12.9% were living with HIV, 21.2% had prior TB, 13.1% had diabetes, and 20.7% had microbiologically confirmed TB. In a blinded out-of-sample test dataset (N=709 participants), the AI model achieved a sensitivity of 80.8% (95% CI 73.7- 86.6) and a specificity of 63.3% (95% CI 59.1- 67.3) for microbiologically confirmed TB, approaching the minimum accuracy targets for a high sensitivity TB screening test (≥90% sensitivity and ≥60% specificity). Accuracy was similar among participants living with HIV (sensitivity: 80.0%, 95% CI 56.3-94.3 and specificity: 64.8%, 95% CI 52.5-75.8).

	Sensitivity n/N, % (95% CI)	Specificity n/N, % (95% CI)
Overall (n=709)	126/156, 80.8% (73.7-86.6)	350/553, 63.3% (59.1-67.3)
PLHIV (n=91)	16/20, 80.0% (56.3-94.3)	46/71, 64.8% (52.5-75.8)
Country		
India (n=79)	7/10, 70.0% (34.8-93.3)	44/69, 63.8% (51.3-75.0)
Philippines (n=166)	23/29, 79.3% (60.3-92.0)	99/137, 72.3% (64.0-79.6)
South Africa (n=80)	11/13, 84.6% (54.6-98.1)	51/67, 76.1% (64.1-85.7)
Uganda (n=249)	63/70, 90.0% (80.5-95.9)	92/179, 51.4% (43.8-58.9)
Vietnam (n=135)	22/34, 64.7% (46.5-80.3)	64/101, 63.4% (53.2-72.7)

Table 1. Accuracy of a vibroacoustic signature for classifying tuberculosis disease

Conclusion: Vibroacoustic data collected with a point-of-care full spectrum electronic stethoscope demonstrated promise as a screening tool for pulmonary TB, including among people living with HIV. Ongoing data collection and algorithm refinement across the full infrasonic-to-ultrasonic range aim to enhance model accuracy and the potential of vibroacoustic diagnostics.

TBS-EP290 Possible role of amino acid synthesis suggested in contributing to tolerance under BDQ pressure in *Mycobacterium tuberculosis* (Mtb) clinical isolates

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Background: Metabolic changes occurring in bedaquiline (BDQ) exposed H37Rv have been reported to contribute to a temporary persistence period (24-96 hours). While a similar persistence period is reported for BDQ-resistant clinical isolates, differences in transcriptome of H37Rv and clinical isolates have been observed. This period thus presents a window to study mechanisms supporting BDQ resistance unique to clinical isolates.

Therefore, we aimed to explore the transcriptomic profile of BDQ-resistant clinical isolates to identify pathways that may be critical in establishing drug tolerance during this period.

Design/Methods: We performed whole transcriptome RNA-seq analysis of clinical Mtb isolates (n=6, BDQ minimum inhibitory concentration (MIC) ≥ 0.5 µg/ml) and H37Rv (MIC = 0.03 µg/ml) after 72 hours of exposure to 3.75µg/ml of BDQ (7.5x MIC of BDQ-R isolates). Differential gene analysis was carried out comparing transcriptome of BDQ-exposed isolates with unexposed controls using DESeq in R studio vr. 4.3.0.

Results: After 72 hours of BDQ exposure, 1123 and 585 genes were significantly differentially expressed (DE) in H37Rv and BDQ-resistant clinical isolates, respectively. For both H37Rv and clinical isolates 22% and 21% of DE genes belonged to intermediate metabolism and respiration. While genes involved in fatty acid and cholesterol degradation were upregulated in both H37Rv and clinical isolates, genes in biosynthesis of amino acids including L-arginine and L-cysteine were upregulated in BDQ-resistant isolates only.

Conclusions: Our findings suggest amino acid metabolism as having an important role in establishing BDQ tolerance by possibly serving as an alternate energy generating pathway. These pathways need to be studied further to understand their role in establishing extensive drug tolerance and resistance and as potential drug targets and prognostic markers of TB therapy.

TBS-EP293 Host driven evolution of antimicrobial resistance in mycobacteria

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Background: Acquired antimicrobial resistance (AMR) rates are higher in TB patients with comorbid conditions such as chronic obstructive pulmonary disease and type 2 diabetes. Oxidative stress in the lung environment and within the macrophage niche of *Mycobacterium tuberculosis* (Mtb), is a feature of these conditions.
We hypothesised that the selective pressures in these host-derived oxidant-rich conditions contribute to the acquisition of Mtb drug tolerance and resistance.
Aims and Methods: The aims of the current study were to establish and evaluate an *in vitro* macrophage model to:
1. Test the effects of intracellular and extracellular oxidants on macrophage phenotypes, and oxidative stress responses;
2. Determine if oxidant-stimulated macrophages were impaired in their abilities to take up and kill mycobacteria;
3. Assess the frequency and spectrum of mutations emerging in conditions of macrophage oxidative stress and;
4. Identify the mechanisms of mutagenesis linked to host OS.
Results: Dysfunction in macrophage uptake and killing of mycobacteria was seen when macrophages were exposed to oxidants at higher concentrations for longer periods compared to short periods. A higher frequency of phenotypic rifampicin resistance was found in macrophages under oxidative stress compared to unstressed macrophages. We used whole genome and shotgun metagenomic analyses to examine the frequency of mutations and mutational signatures related to increased host oxidative stress. Transcriptomic analyses of mycobacterial DNA damage and repair pathways was used to identify mycobacterial gene functions compromised by host oxidative stress.
Conclusions: This study developed a tractable model of macrophage oxidative stress to facilitate future investigations of Mtb DNA damage and mutagenesis mediated by host immune responses. Understanding mycobacterial oxidative DNA repair pathways compromised by the host may inform strategies to minimise mutations emerging when TB antibiotic treatment is commenced.

TBS-EP296 Polymer microparticles surface functionalized with phages to improve intracellular efficacy of phage therapy

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Background: The growing prevalence of drug-resistant tuberculosis highlights the need for alternative antimicrobial strategies. Phage therapy is a promising approach, but its efficacy against intracellular pathogens is limited. Phage delivery using polymer microparticles may enhance phage stability and intracellular uptake.
This study aimed to evaluate and compare the activity of free and PLGA-adsorbed mycobacteriophage D29 against *Mycobacterium smegmatis* in infected human macrophages.
Materials and Methods: Human monocytic cells were differentiated into macrophages and infected with *M. smegmatis* at a multiplicity of infection of 10 (MOI 10). Mycobacteriophage D29 was adsorbed onto porous PLGA microparticles via passive nonspecific adsorption by hydrophobic interactions. Infected macrophages were treated with equivalent doses of free phages or PLGA-adsorbed phages (MOI 10). Over a 72-hour period, extracellular and intracellular bacterial and phage titers were measured using colony counting and plaque assays, respectively.
Results: Bacteria were detected in the supernatant throughout the experiment, with a notable decline after 60 hours, likely due to macrophage lysis and release of intracellular bacteria into the extracellular space, where phage replication was more efficient. Intracellular bacterial levels remained stable for the first 24 hours, followed by a decline after 36 hours, coinciding with increasing free phage concentrations.
In untreated controls, bacterial counts continued to rise. Phages adsorbed on the surface of polymeric microparticles achieved faster intracellular delivery and higher titers after 24 hours (7.6×10^6 PFU/ml vs. 2×10^4 PFU/ml for free phages), resulting in earlier and more pronounced bacterial reduction.
Conclusions: Mycobacteriophage D29 effectively reduced *M. smegmatis* populations both extracellularly and intracellularly, although the intracellular effect was delayed. Polymer microparticle adsorption improved phage delivery to macrophages, leading to earlier onset of an-

tibacterial activity. Complete elimination of bacteria was not achieved within the experimental timeframe. Future strategies may involve combining phages with antibiotics to enhance efficacy and reduce treatment duration.

TBS-EP299 Identification of bacterial cell envelope factors that influence tuberculosis treatment outcome

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Bacterial factors are assumed to influence tuberculosis disease and treatment outcome. Yet, this remains poorly investigated in the context of human infection.
In the frame of the SMA-TB EU-funded project (GA847762) Phase II clinical trial (NCT04575519), conducted to evaluate ibuprofen and acetylsalicylic acid as anti-inflammatory adjunctive to anti-tuberculosis treatment, we analyzed a set of 155 *Mycobacterium tuberculosis* clinical isolates collected at baseline to explore the relationship between the abundance of certain compounds in the bacterial envelope and the clinical data of patients.
M. tuberculosis cell envelope is typified by its extraordinarily high and diverse lipid content, most of these lipids exhibiting immunomodulatory properties in vitro or in animal models of infection.
We quantified the lipoglycan lipoarabinomannan (LAM), the lipoprotein 19 kDa, and a series of lipids and glycolipids, including mycolic acids, phtiocerol dimycocerosate (DIM), triacylglycerols (TAG), sulfoglycolipids (SGL), diacyltrehaloses (DAT), phosphatidylinositol mannosides (PIM), and tuberculosinyladenosine (TbAd) in bacterial strains grown on solid medium, using dot-blot and targeted lipidomic analyses.
We also investigated the capacity of the *M. tuberculosis* strains to activate NF-kB, a key transcription factor in the secretion of pro-inflammatory molecules, in THP-1 macrophages.
We found that the production of some of the bacterial compounds analyzed was statistically different between the strains isolated from either good or bad responder patients in term of time to stable sputum culture conversion, and evolution of TB score during treatment. We also observed that patients who had a bad evolution of X-Ray score were associated with the *M. tuberculosis* strains that induced NF-kB the most.
Altogether, our data strongly suggest that bacterial factors, as well as the intrinsic inflammatory potential of *M. tuberculosis* strains, influence human tuberculosis disease and treatment outcome.

TBS-EP305 Long-acting bedaquiline: A novel preventive strategy against tuberculosis in a murine model

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Background: Although isoniazid preventive therapy (IPT) for tuberculosis (TB) is recommended by the WHO for people living with HIV, its use remains limited. Bedaquiline long-acting (BDQ-LAI), an injectable antitubercular drug with a long terminal half-life (23 weeks), may simplify TB prevention, akin to long-acting antivirals. This study evaluated BDQ-LAI as a preventive therapy using a novel murine model.
Methods: Seventy-two female Balb/c mice (6 weeks old) were assigned to three treatment groups receiving BDQ-LAI intramuscularly at low, middle or high dosing (N=24/group), and one untreated control group (N=30). Ten days post-treatment, all mice were infected intranasally with 32 CFU/mouse of M. tuberculosis H37Rv. On day 1 post-infection, six untreated mice were sacrificed to assess baseline lung CFU and plasma exposure. Lung CFU counts and drug levels in plasma and lungs were assessed on days 14, 21, 28, and 100 in six mice per group.
Results: in the untreated control group, CFU increased up to 5.7+/-0.6 log10 CFU at D100.The low dose of BDQ-LAI, did not prevent bacillary growth (5.4+/-0.7 log10 CFU at D100) and had a minimal impact on bacterial replication. The high BDQ-LAI dose completely prevented bacillary growth at all time-points evaluated. The middle BDQ-LAI dose displayed intermediate activity with 2/6 mice culture positive at D14, D21 and D28 (with 0.6 to 1.2 average log10 CFU count) and no positive mouse at D100.
Conclusions: BDQ-LAI demonstrated dose-dependent protection against TB in mice, with complete prevention at the highest dose. These findings support further investigation of BDQ-LAI as a simplified, long-acting TB preventive therapy, particularly beneficial for high-burden regions and global TB control efforts.

TBS-EP308 Shifts in Mycobacterium tuberculosis complex lineages and drug resistance patterns in Georgia: A whole genome sequencing-based cohort study (2014–2020)

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Background: Understanding the lineage distribution of *Mycobacterium tuberculosis* complex (MTBC) strains and their association with drug resistance is essential for informing public health strategies and tuberculosis (TB) control efforts in country.
Methods: We conducted a prospective cohort study of patients with culture-confirmed pulmonary tuberculosis treated at the National Center for Tuberculosis and Lung Diseases in Tbilisi, Georgia, from 2014 to 2020. Clinical and genomic data were stored in the NIAID TB Portals database. Whole genome sequencing was performed on DNA extracted from 1,516 MTBC isolates using Illumina platforms. Lineages (L) and genotypic resistance profiles were determined using the MTBseq bioinformatics pipeline.
Results: Among 1,516 patients, 705 (46.5%) had drug-susceptible TB (DS-TB), 210 (13.9%) had non-multidrug-resistant (MDR) TB, 510 (33.6%) had MDR-TB, and 91 (6%) had pre-extensively drug-resistant (XDR) or XDR-TB. Strains belonging to L2 were identified in 729 (48.1%) patients, while strains of L4 were found in 753(49.7%); 34(2.2%) isolates belonged to other or mixed lineages. L4 strains were predominant among patients with DS-TB (492/705,69.7%; $p \leq 0.001$), whereas L2 strains were significantly associated with MDR, pre-XDR, and XDR-TB (481/599,80.3%;$p \leq 0.001$).
While in 2014, 76.8% (103 out of 134) of patients were infected with a L2 strains, this proportion decreased to 36.1% (126 out of 349)in 2020, coinciding with an increase in DS-TB cases and a decline in the prevalence of MDR, pre-XDR and XDR-TB cases.
Conclusion: Our findings demonstrate a strong association between MTBC Lineage 2 and drug-resistant tuberculosis, including MDR, pre-XDR, and XDR-TB, in Georgia. The predominance of Lineage 4 among drug-susceptible TB cases suggests differential transmission dynamics and pathogenicity between major MTBC lineages. Notably, the substantial decline in the proportion of L2 strains from 2014 to 2020 coincided with a marked reduction in drug-resistant TB burden, underscoring the potential impact of public health interventions targeting L2-driven transmission.

TBS-EP311 Sputum microbiome among newly admitted patients with HIV in a high TB prevalence setting: A study from a teaching hospital in Ghana

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Background: Emerging evidence links the respiratory microbiome to tuberculosis (TB) susceptibility and progression, but its role in severely ill patients with HIV is unclear.
This study investigated whether the sputum microbiome at hospital admission differed by (i) TB status at 8 weeks and (ii) 8-week survival.
Furthermore, we investigated whether the sputum microbiome collected at 8-week follow-up differed by (iii) TB treatment status.
Methods: Adults with HIV admitted to Korle-Bu Teaching Hospital (Oct 2019–Nov 2021) with severe illness, advanced HIV, or TB symptoms were prospectively enrolled. Admission and 8-week follow-up sputum were cryopreserved and analyzed by 16S rRNA microbiome analysis (Illumina) at Noguchi Memorial Institute for Medical Research. QIIME 2 was used for bioinformatics. TB definition was based on any specimen GeneXpert, sputum culture, urine Determine LF-LAM, or sputum 16S.
Results: Seventy-one patients provided admission sputum; 23 provided 8-week follow-up sputum. Patients with TB (n=39) vs. without TB (n=32) were similar in age (median 42 years), CD4 count (median 74 cells/mm^3), and ART coverage (32%). More patients with TB were female (72% vs. 53%) and fewer were newly diagnosed with HIV (44% vs. 69%). Two and 5 patients were excluded from diversity respective taxonomy analyses due to poor sequence quality.
No significant differences in alpha diversity (Shannon Index) or beta diversity (Bray-Curtis & PERMANOVA) were observed when stratified by TB status or 8-week survival (**Figure 1A-B**). However, significant differences in alpha (p=0.03) and beta diversity (p=0.016) were ob-

served in follow-up sputum stratified by TB treatment status (**Figure 1C**). Taxonomic analysis showed reduced prevalence of *Mogibacterium* and *Lancefieldla* among participants on anti-TB treatment. Among patients starting TB treatment during follow-up, we observed a shift from *GWA2-37-10* to *Actinomyces*.

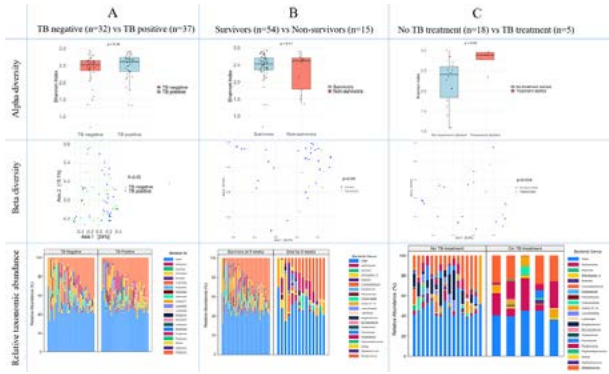

Figure 1.

Conclusion: Sputum microbiome diversity and taxonomy differed by TB treatment status but not by TB diagnosis or survival among inpatients with HIV.

TBS-EP314 Plasma metabolites of tryptophan catabolism and reduced lung function during and after TB treatment

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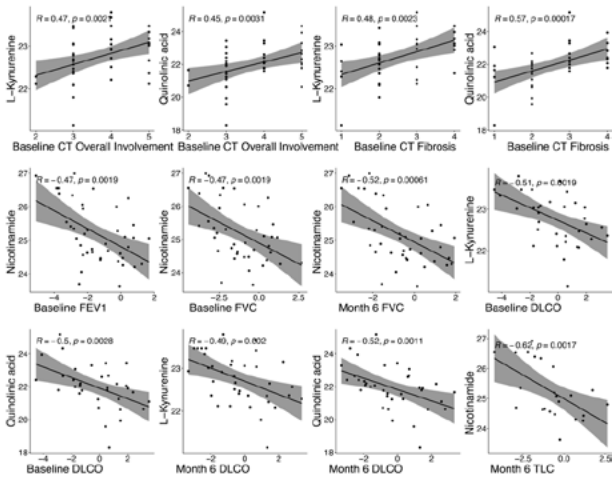
Introduction: Despite the global burden of post-TB lung disease (PTLD), metabolic pathways driving pathologic tissue damage are poorly understood. We evaluated the association between plasma metabolites and lung health during and after TB treatment.

Methods: We collected blood plasma from adults with and without HIV who were newly diagnosed with drug-susceptible pulmonary TB in Johannesburg, South Africa and enrolled in a longitudinal cohort study within 2 weeks of TB treatment initiation. Metabolomics was performed on plasma using hydrophilic interaction liquid chromatography coupled to an Orbitrap mass spectrometer.

Pulmonary function testing was performed at baseline, 6 months (end of TB treatment), and 12 months, and high-resolution chest CT was performed at baseline and 12 months and semi-quantitatively scored by a radiologist. Spearman's correlation was calculated between metabolites and pulmonary variables (p-value < 0.05, FDR < 0.05).

Results: Among 40 participants, 7 (18%) were female, the median age was 37 (IQR 32-49), and 12 (30%) had HIV coinfection. At baseline, 22 (55%) had a reduced forced expiratory volume in 1 second (FEV1) (z-score ≤ 1.65) and 39 (98%) had radiographic abnormalities encompassing > 25% of the lungs. Among 177 known metabolites, 76 were correlated with lung function or radiographic involvement, including several linked to tryptophan catabolism and NAD+ biosynthesis/catabolism, namely kynurenine, quinolinic acid, and nicotinamide (Figure). Kynurenine and quinolinic acid correlated inversely with baseline and 6-month DLCO, and positively with overall CT involvement and fibrosis, while nicotinamide correlated with baseline FEV1 and forced vital capacity (FVC) and 6-month FVC and total lung capacity (TLC).



Conclusion: Among individuals with pulmonary TB, metabolites reflecting tryptophan catabolism and NAD+ biosynthesis correlated with impaired lung function and greater radiographic involvement, both at the time of diagnosis and after TB treatment completion. Future analyses can explore whether these metabolites function as biomarkers of PTLD risk.

TBS-EP317 Collagen-targeted PET/CT for evaluation of post-TB lung disease in adults with TB

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Post-TB lung disease (PTLD) is characterized by fibrosis after TB treatment, but novel tools to assess pulmonary profibrotic activity are needed. We used a type I collagen-specific positron emission tomography (PET) probe, ^{68}Ga-CBP8, to test whether increased PET signal correlates with worse lung function and radiographic abnormalities in adults with pulmonary TB in Johannesburg, South Africa.

We enrolled 55 adults (14 females, 20 with HIV) with first-time, microbiologically confirmed, rifampin-susceptible pulmonary TB within two weeks of starting four-drug therapy. At baseline, patients received ~151 MBq of ^{68}Ga-CBP8 intravenously, followed by PET/CT imaging.

High-resolution CT (HRCT) was performed at baseline and scored by a radiologist using standardized systems for overall lung involvement, fibrosis, and consolidation. Lung segmentation was performed using MIM 7.2.2 to determine the percentage of lung volume with PET signal above mean standardized uptake value (SUV) ≥1, adjusted to blood SUV. Pulmonary function tests, including spirometry normalized as z-scores, were performed at baseline and treatment completion.

Multivariable linear regression adjusted for age, sex, and HIV status. ^{68}Ga-CBP8 uptake localized to TB-affected lung regions on CT, including cavity walls. Higher PET signal at diagnosis was significantly and independently associated with lower forced expiratory volume in one second (FEV_1), lower forced vital capacity (FVC), and greater radiographic involvement, consolidation, and fibrosis at baseline (Table).

Baseline PET signal also correlated with lower lung function at treatment completion. Increased ^{68}Ga-CBP8 PET signal at TB diagnosis is associated with worse lung function and radiographic involvement early during treatment and at treatment completion in adults with pulmonary TB. PET imaging of fibrosis offers a promising clinically translatable approach for early detection of fibrotic changes in PTLD, potentially informing prognosis and guiding antifibrotic interventions. Follow-up HRCTs at month 12 are being performed to assess relationships between baseline PET signal detection and lesion persistence.

Time point	Baseline		At treatment completion	
	Adjusted β (95% CI)	P-value	Adjusted β (95% CI)	P-value
FEV_1 z-score	-0.29 (95% CI -0.54 to -0.04)	0.023	-0.38 (95% CI -0.64 to -0.13)	0.007
FVC z-score	-0.36 (95% CI -0.61 to -0.10)	0.007	-0.44 (95% CI -0.68 to -0.19)	0.001
DLCO z-score	-0.32 (95% CI -0.68 to 0.05)	0.086	-0.35 (95% CI -0.61 to -0.08)	0.013
HRCT overall involvement score	1.78 (95% CI 0.83 to 2.73)	<0.001		
HRCT consolidation score	1.33 (95% CI 0.73 to 1.94)	<0.001		
HRCT fibrosis score	1.04 (95% CI 0.24 to 1.84)	0.012		

Table. β coefficients, adjusted for age, sex and HIV, relating lung PET signal to lung function and radiology scoring.

TBS-EP320 Long-term morbidity after tuberculosis treatment in a high-burden country

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Background: Survivors of tuberculosis (TB) may face increased risks of acute and chronic health conditions after completing anti-TB therapy. However, few cohort studies in high-TB burden countries have systematically examined changes in morbidity patterns before and after treatment.

Current criteria for determining treatment completion rely on standard treatment duration, sputum culture, or acid-fast bacilli (AFB) smear conversion. However, these indicators may not fully capture long-term clinical outcomes.

Objective: To assess changes in the monthly number of diagnosed cases and hospital admission rates for lower respiratory tract infections (LRTIs), chronic respiratory diseases (CRDs), and diabetes mellitus (DM) before and after TB treatment.
Methods: A retrospective cohort of patients who survived during TB treatment was linked to the Health Data Center (HDC), managed by the Ministry of Public Health, Thailand. Diagnoses recorded during the "pre-TB" period (–30 to –6 months before treatment) and the "post-TB" period (+6 to +30months after treatment) were identified using ICD-10 codes and categorized as LRTIs (J12–J18), CRDs (J40–J47), or DM (E10–E14). Monthly diagnosis rate ratios (IRRs) and hospital admission IRRs (post- vs. pre-TB) were calculated with 95% confidence intervals (CIs) using a Poisson Regression model.
Results: A total of 757 patients were analyzed. The monthly number of LRTIs diagnosis increased non-significantly after TB treatment (IRR 1.38; p = 0.091), while hospital admissions rose markedly (IRR 15.20; p = 0.008). CRD diagnosis nearly doubled post-TB compared to pre-TB (IRR 2.42; p < 0.001), with a fivefold increase in admission risk (IRR 4.90; p < 0.001). DM diagnosis increased by 36% post-TB (IRR 1.36; p < 0.001) and remained elevated throughout follow-up.

Conclusions: These findings highlight the importance of incorporating long-term clinical indicators into TB care. Such indicators may support more individualized treatment durations and improved patient outcomes.

TBS-EP326 The ability of patients with TB disease to control mycobacterial replication in vitro is not impaired by diabetes

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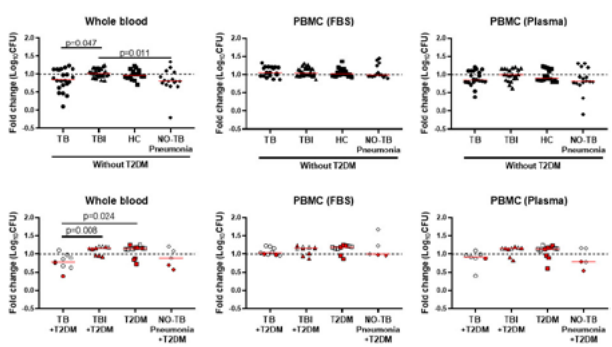
Background: This study investigated the ability of immune cells from different cohorts to control the mycobacterial outgrowth to identify possible correlates of protection and evaluate the impact of type 2 diabetes mellitus (T2DM), a known risk factor for tuberculosis (TB), on mycobacterial growth.
Methods: We enrolled 120 subjects, including patients with TB disease (n=22), TB and type 2 diabetes (TB-T2DM) (n=9), TB infection (TBI, n=29), TBI-T2DM (n=10), healthy controls (n=16), T2DM (n=12), subjects with pulmonary disease other than TB (NO-TB pneumonia, n=16) and NO-TB pneumonia with T2DM (n=6). The mycobacterial growth inhibition assay (MGIA) was performed for each sample. Both whole blood (WB) and fresh peripheral mononuclear cells (PBMCs), supplemented with fetal bovine serum (FBS) or autologous plasma, were infected with about 150 CFU of BCG Pasteur for 4 days, then lysed and incubated in the BACTEC MGIT instrument until positivity.
Results: Preliminary results show a significantly higher ability of TB patients to control BCG replication compared to TBI patients (p=0.047), as detected by MGIA performed on whole blood. Similarly, whole blood of TB patients with T2DM (TB-T2DM) significantly controls BCG growth compared to both TBI (p=0.008) and T2DM subjects (p=0.024). In contrast, PBMCs supplemented with FBS or autologous plasma do not show significant differences in their ability to control BCG outgrowth between TB patients and TBI. Moreover, no significant differences were found between diabetic and non-diabetic subjects within each group in any of the cell systems evaluated, whether whole blood or PBMC supplemented with FBS or autologous plasma.



Conclusions: These findings indicate that factors in the blood of individuals with TB disease modulate BCG outgrowth. Ongoing research is assessing whether secreted immune factors or antibodies are expressed differently across various groups. Identifying immune factors involved in mycobacterial control may help define new biomarkers of protection in TB.

TBS-EP329 Population impact of new TB vaccines may depend on efficacy against infectious asymptomatic TB: A modelling study

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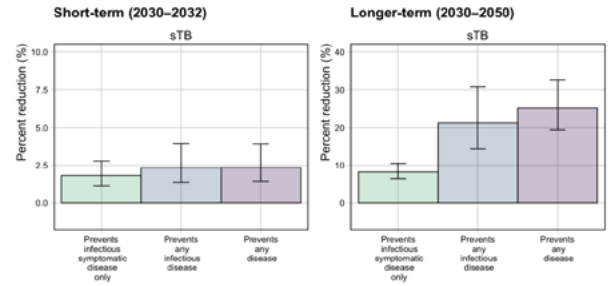
Background: Tuberculosis (TB) remains a leading cause of infectious disease death. Modelling predicts new TB vaccines may reduce global burden but rely on assumptions about vaccine efficacy by TB disease stage and TB natural history, which may be incorrect. We explored the sensitivity of estimates of the impact of new TB vaccines to uncertainties in efficacy by disease stage and natural history.
Methods: We developed a dynamic compartmental TB model for India, including early TB disease stages. Scenarios assumed 50% vaccine efficacy for 10 years and prevented progression to a) only infectious symptomatic disease, or b) any infectious disease, or c) any disease.
We estimated impact on averting disease episodes over 2030–2050, compared to no-new-vaccine introduction.
Results: Results suggest, over three years, there was little difference in the proportion of cumulative symptomatic disease episodes averted by vaccines preventing only infectious symptomatic disease, any infectious disease, or any disease (1.8%, 2.3%, and 2.4%, respectively).
However, over 20 years, compared to vaccines preventing only infectious symptomatic disease, vaccines preventing any infectious disease, or any disease, averted a markedly higher proportion of symptomatic disease episodes (8.2%, 21.0%, and 25.1%, respectively), due to preventing continued transmission from infectious asymptomatic disease.

Figure Percent reduction in symptomatic TB episodes for each vaccine scenario compared to no-new-vaccine introduction over the short- and longer-term



Abbreviations: sTB = symptomatic tuberculosis

Conclusions: The population impact of new TB vaccines may depend on efficacy against infectious asymptomatic disease. TB vaccine trials should measure impact on infectious asymptomatic disease to enable better estimates of the potential value of new TB vaccines. Further data collection is required to better understand the transmissibility, morbidity, and dynamics of asymptomatic disease.

TBS-EP332 Comparison of phylogenetic metrics of transmission in symptomatic and asymptomatic tuberculosis

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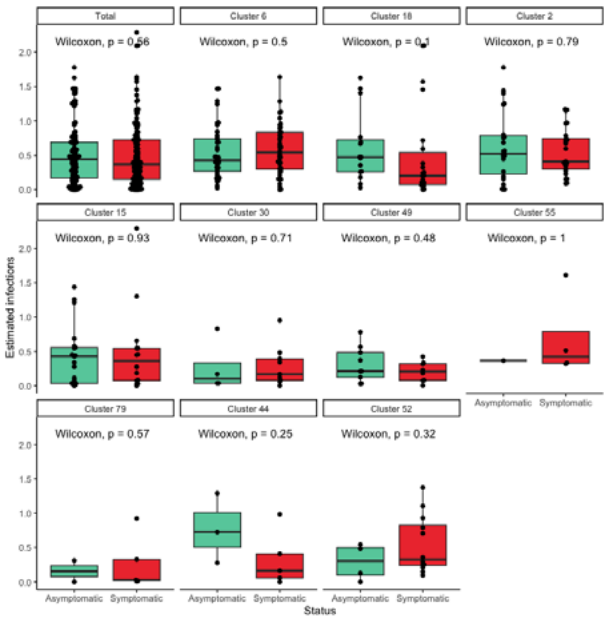
Background: *Mycobacterium tuberculosis* (*Mtb*) transmission remains a critical challenge in high-burden settings. While tuberculosis control efforts traditionally target symptomatic individuals, the contribution of asymptomatic cases to ongoing transmission remains poorly understood.
Methods: We conducted a genomic and epidemiological analysis of *Mtb* strains collected in Mato Grosso do Sul, Brazil, between 2008 and 2024. From 2017 to 2022, tuberculosis (TB) active case finding was performed in three of the largest prisons in the state, whereby sputum was collected from individuals irrespective of symptoms and tested by GeneXpert and culture. We evaluated phylogenetic clustering, Time-scaled Haplotype Density (THD), Local Branching Index (LBI), and Bayesian Reconstruc-

tion and Evolutionary Analysis of Transmission Histories (BREATH) to compare metrics of transmission between symptomatic and asymptomatic individuals.

Results: We sequenced 2,794 *Mtb* strains, yielding 2,362 high-quality lineage 4 sequences. Among 2,362 individuals with TB, 1,137 were incarcerated at the time of diagnosis, of which 505 were identified through active case finding: 277 had symptomatic disease and 228 had asymptomatic TB.

While incarceration status was strongly associated with higher transmission metrics (THD estimate = 0.60, $p < 0.001$; LBI estimate = 0.00071, $p < 0.001$), there was no significant difference in phylogenetic clustering proportion (77% vs. 85%; p= 0.816), THD (median 0.50 vs. 0.39; p = 0.120), or LBI (median 0.00863 vs. 0.00871; p = 0.086) between symptomatic and asymptomatic individuals.

Bayesian transmission trees revealed no significant difference in the number of secondary infections inferred from symptomatic compared with asymptomatic individuals (p = 0.56) (*Figure 1*). These findings were consistent across genomic clusters and robust to model assumptions.



Conclusions: Evidence from multiple genomic metrics of transmission identified no differences in isolates from symptomatic compared with asymptomatic individuals, underscoring the substantial contribution that asymptomatic TB makes to transmission at the population level.

TBS-EP335 A new blood-based RNA signature (R7), effectively identifies TB disease and predicts response to therapy

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Tuberculosis (TB) treatment requires a six-month drug regimen with effectiveness often unclear until months into therapy. Delays in TB diagnosis and difficulty identifying treatment non-responders increases the risk of developing drug resistance, further lung damage and continued transmission. There is an urgent need for new non-sputum-based tools to aid early TB diagnosis and monitor treatment response.

Through transcriptomes analysis of 45 candidate genes in blood, we identified a 7-gene signature (R7) that distinguishes individuals with active multi-drug resistant (MDR) TB from controls (AUC 0.838 95% CI: 0.919-0.682). In a Vietnam cohort study this signature-accurately identified successful treatment responders after 4- and 6-months treatment AUC 0.817 95% CI: 0.936-0.549 and AUC 0.762 95% CI: 0.918-0.395, respectively.

The R7-score also differentiated active TB from Healthy controls across other published cohorts in South Africa and Gambia (GSE 79362) and South India (GSE 193777) with AUC between 0.777-0.928 95% CI 0.72-1.

Further, the R7 signature also successfully predicted response to therapy in a South African cohort (GSE89403) at 7 days, week 4 and week 24 with AUCs between 0.800-0.920. This novel R7-score signature could also distinguish TB from other lung diseases including Pneumonia and Lung Cancer (GSE 42834): AUC 0.841-0.908. The R7-gene signature performed well in all age groups, and was more enriched with female patients, at the diagnostic point.

These findings support the R7-score as a promising biomarker to aid, both TB diagnosis and predict the response to therapy in patients.

TBS-EP338 Granulysin antimicrobial activity promotes dormancy in *Mycobacterium tuberculosis*

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Human tuberculosis (TB) caused by *Mycobacterium tuberculosis* (*Mtb*) remains a global public health threat. Granulomas constitute a hallmark of TB pathogenesis that can clear, contain or exacerbate an infection. Containment is exploited by *Mtb* as a hideout to persist in a dormant, antibiotic-tolerant state only to resuscitate upon immunosuppression. The immune determinants of a granulomatous response driving *Mtb* persistence remain elusive.

We here generated *ex vivo* granulomas from peripheral blood mononuclear cell specimens of TB patients and applied high-dimensional mass cytometry to elucidate immune factors prompting *Mtb* dormancy.

Compared to healthy controls, patient-derived *ex vivo* granulomas rapidly forced *Mtb* to become dormant-like. This observation correlated with an enrichment in activated, innate (-like) cytotoxic lymphocytes and required the presence of $CD56^+$ lymphocytes or more specifically, the content of their granules.

Finally, we demonstrated that direct exposure to granulysin induces *Mtb* dormancy, thereby unravelling an immune escape mechanism to cytotoxic lymphocyte activity. Our findings may inspire clinical TB research, for tailored boosting of granulysin activity could prevent proliferation and favor *Mtb* clearance from the lung of infected individuals. Reciprocally, neutralization of granulysin activity could promote *Mtb* resuscitation and susceptibility to antibiotics to shorten treatment.

In addition, cytotoxic functions and granulysin production in particular may be considered as relevant correlates of protection urgently needed for TB vaccine development.

TBS-EP341 Peripheral CD34+ cells as a potential niche for *Mycobacterium tuberculosis*

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Background: Effective tuberculosis (TB) control and reduction of Mycobacterium tuberculosis (Mtb) transmission necessitate accurate diagnosis of TB infection (TBI), as well as the identification of TB progressors, TBI individuals at higher risk of developing the disease.

Since no gold standard exists for TBI diagnosis, and the Mtb immune-response based methods have a low positive predictive value for disease progression, new methodologies are necessary. Recent studies, including ours, have shown the presence of Mtb-DNA in peripheral CD34+ cells of TBI or TB individuals.

However, it remains unclear whether:

i. Mtb can infect CD34+ cells, and;

ii. Mtb-DNA detection correlates with the host immunological state.

Objectives:

1. Evaluate whether Mtb can infect CD34+ cells;

2. Evaluate whether Mtb-DNA presence differs between immunocompromised and immunocompetent TBI subjects.

Methods:

Objective 1: CD34+ cells isolated immunomagnetically from peripheral blood mononuclear cells (PBMC) of healthy donors (95% purity) were in vitro infected with constitutively fluorescent laboratory Mtb strains (H37Rv) and analysed by confocal microscopy.

Objective 2: We enrolled a cohort of immunosuppressed TBI with concomitant rheumatological diseases or multiple sclerosis (n=86), immunocompetent TBI (n=52), immunocompetent TB (n=60), and Mtb-uninfected (n=52) individuals. CD34+ cells were isolated from PBMC, DNA extracted, and Mtb genome level measured by digital-PCR (dPCR) detecting IS6110 and rpoB sequences.

Results:

Objective 1: We observed intracellular localization of Mtb in CD34+ cells at a low frequency (<3%), using a three-dimensional reconstruction of images by confocal microscopy.

Objective 2: Mtb-DNA was detected in less than 10% of CD34+ cells in immunosuppressed TBI, similarly to immunocompetent TBI individuals.

Conclusions: Our research indicates that CD34+ cells can be infected by Mtb and may serve as a potential reservoir for this bacterium. These findings propose a novel method for diagnosing TBI, which involves directly identifying Mtb rather than relying solely on measuring the host's immune response.

TBS-EP344 Mycobacterium tuberculosis complex lineage 1: A frequent but neglected cause of tuberculosis with implications for vaccine design

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The genetic diversity of MTBC, although smaller when compared to other bacteria, is not to be ignored. This diversity is due to SNPs, indels, repeats, duplications, and homologous recombination within the MTBC genome. MTBC genetic diversity has implications on regulation of gene translation and in epigenetic mechanisms, which allow for phenotypic variation. Because of phenotypic variation, we observe between- and within-lineage differences in MTBC clinical phenotypes.
Unfortunately, most TB vaccines in the clinical pipeline fail to consider MTBC genetic diversity. Many of these vaccines are based on BCG or on L4 strains. However, most high burden TB countries are actually L1-endemic countries. L1 also infects more TB patients than any other MTBC lineage. The objective of our research hence, is to understand the understudied MTBC L1, in terms of its genetic diversity, distribution and clinical phenotypes.
We studied around 4000 representative L1 genomes from all over the world using short- and long-read sequencing. With long-read sequencing, we are comparing the genes implicated in host-pathogen interaction and virulence. With short-reads, we examined the distribution and genetic distance of different L1 strains.
Moreover, we looked at genomes covering 27 years in the Philippines – a L1-endemic country that has the highest population of L1 cases globally and is also a high burden country for TB, TB-HIV, and RR/MDR-TB.
Preliminary results of our research suggest that the genetic diversity within L1 alone is significantly high. The distribution of different L1 strains indicate possible local adaptation to certain populations.
Lastly, the contribution of L1 in drug resistance epidemics is currently underestimated. Our research suggests that TB vaccine development will benefit greatly from being informed of L1 diversity

TBS-EP347 Targeted sequencing directly on sputum samples for optimizing detection of *M.tuberculosis*

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Background: Targeted next-generation sequencing (tNGS) enables early, comprehensive detection of genotypic drug susceptibility testing (gDST). Current methods have a long turnaround time (TAT) and are also validated for decontaminated samples which may decrease sensitivity. Our aim was to investigate whether tNGS with Nanopore directly on sputum samples would reduce TAT and enable detection on paucibacillary samples.
Method: Pooled Mycobacterium tuberculosis complex-negative sputum samples were spiked in triplicates with 10^4 and 500 CFU/ml of *M. tuberculosis* ATCC 27294 (Mtb) and analysed with Abbot real time PCR with and without decontamination. Samples were then concentrated and heat inactivated in 80°C for 20 minutes. After DNA extraction using the EZ1 Tissue Kit (Qiagen), target enrichment was performed with Deeplex Myc-TB (GenoScreen), followed by library preparation (Rapid Sequencing Kit V14) and sequencing with Flongle flow cell on MinION MkC1b (Oxford Nanopore). Data was analysed with an in-house pipeline in CLC (Qiagen).
Finally, tNGS was performed on clinical samples comparing the standard protocol using decontaminated samples and Illumina sequencing and direct Nanopore sequencing.
Results: By Abbot PCR-analysis, decontaminated samples had a significantly higher cycle threshold (Ct) than direct analysis (mean±SD: 31.0±3.3), at 10^4 CFU/ml compared to direct sputum samples (24.7±2.2, n=18). In spiked sputum samples, comparing Deeplex standard protocol using decontaminated samples and Illumina sequencing, direct analysis of sputum samples with Nanopore sequencing showed similar performance for gDST (97-100% coverage) down to 10^3 CFU/ml. Smear positive clinical samples (n=3) showed a 100% resistance gene coverage in both methods. TAT for the standard protocol and optimized protocol was 144-168 h and 10-21h respectively.
Conclusion: Nanopore tNGS analysis directly on sputum with Deeplex kit is efficient and at least as sensitive as analysis from decontaminated samples. Further investigation of the sensitivity of nanopore tNGS directly on sputum in clinical samples is warranted.

TBS-EP350 Distinct macrophage subsets associate with varying roles that contribute to human lung tissue damage during TB disease

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Tuberculosis (TB) remains a significant global health challenge, with many previously exposed individuals suffering from persistent pulmonary dysfunction due to lung complications. A hallmark of TB progression is granuloma formation, which results from a complex interplay of immune cells mediating regulatory, inflammatory, and fibrotic responses. When these immune responses become dysregulated, pulmonary caseation and fibrosis can occur, even after Mycobacterium tuberculosis has been cleared. Macrophages are central to this process, playing a major role in the formation and maintenance of TB-induced granulomas.

Therefore, we sought to characterize and demonstrate the presence of distinct macrophage subsets associated with TB-induced lung pathology. Through immunofluorescent assay, we identified macrophage subsets with unique protein signatures (CD68+ ACE, CD68+ SPP1+, CD68+ CD206+, CD68+ MARCO+, CD68+ CD163+) that are potentially involved in various roles during disease progression. These subsets were spatially localized across different regions of granulomatous lung pathology during TB.

Furthermore, our *in vitro* and *in vivo* assays revealed the presence of inflammatory macrophage subsets driven by ALOX5 signaling, which contributed to lung pathology development.

Notably, the CD68+ MARCO+ macrophage subset was highly expressed in the inflammatory layer of caseous granulomas, exhibiting fibroblast-like characteristics, suggesting a role in fibrosis during TB. This role was further supported by the subset's expression of TGF-beta, a known driver of fibrosis.

The study provides compelling evidence of the diverse macrophage subsets present in patients with TB-related complications.

Therefore, our findings reveal the presence of heterogeneous macrophages, which mediate a complex interplay of the host's immune responses, contributing to regulation, inflammation, and fibrosis during TB progression. As such, the varying macrophage subsets could serve as critical targets for the development of improved therapeutics and novel vaccine candidates to better manage TB.

TBS-EP491 Lineage identification and mutation profile of *Mycobacterium tuberculosis*: A study from National Reference Laboratory, India

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Purpose: The present study aimed to find out the most prevalent lineage of *Mycobacterium tuberculosis* (MTB) and analysis of their mutation profile conferring to drug resistance at National Reference Laboratory (NRL) in New Delhi.

Methods: A total 212 liquid culture MTB isolates of presumptive multidrug resistance tuberculosis (MDR-TB) patients were selected at NRL and subjected to whole genome sequencing (Illumina Miseq, USA). The genome sequencing data of 194 samples was successfully obtained in fastq files from instrument and analysed by Mykrobe predictor for lineage and mutation identification conferring drug resistance.

Results: In a total 194 isolates, the number of isolates belonging to lineage and sub-lineage of lineage 1, 2, 3 and 4 were 13 (6.7%), 63 (32.4%), 82 (42.2%) and 28 (14.4%) respectively. Out of total 194 culture isolates analysed, 179 harbor at least one or more mutations. Among these 179 mutated isolates, following gene mutations were found in either single or in combinations: *rpoB* (146, 81.5%), *katG* (138, 77%), *pncA* (62, 34.6), *gyrA* (121, 67.5%), *embB* (106, 59.2%), *rpsL* (86,48%) followed by *fabG1* (31, 17.3%), *embA* (18,10%), *gid* (6,3.3%), *inhA* (4), *eis* (4,2.2%), *rrs* (17, 9.4%).

Lineage 2 was found to be most mutated MTB strains having atleast one or more mutations. In lineage 2, the frequency of *rpoB, katG, gyrA, embB*, and *pncA* gene mutations was 92%, 82.5%, 93.6%, 68.2%, and 61.9%, respectively. This was higher than in lineage 1 (30.7%, 53.8%, 15.2%, 38.4%, 0% respectively), lineage 3 (69.5%, 68.2%, 46.3%, 46.3%, 24.3% respectively), and Euro-American lineage 4 (74%, 62.9%, 48.1%, 40.7%, 26.9% respectively).

Conclusions: Based on this study, lineage 3 may the most prevalent strain of MTB in north India. More attention required to take care patients having Lineage 2 infection to break chain of transmission as it was found to be most mutated/resistant strains.

TBS-EP493 Oral rinse outperforms facemask capture for non-sputum diagnosis of pulmonary TB

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Background: Non-sputum-based rapid diagnostics are urgently needed to test both symptomatic and asymptomatic people with tuberculosis (TB) who are missed by current sputum-based tools. We performed head-to-head comparison of two non-sputum sampling approaches, oral rinse and facemask capture, for diagnosis of pulmonary TB.
Methods: We recruited HIV-negative adults (≥18 years) with newly-diagnosed, bacteriologically-confirmed pulmonary TB and healthy controls in Worcester, South Africa (October 2024-May 2025). TB participants were excluded if treated for >1 day or previously diagnosed within 2 years. Facemasks fitted with polyvinyl alcohol (PVA) patches were worn for ≥1 hour. Thereafter, a patch was dissolved in 2mL sterile water. Oral rinse samples were obtained using a 1-minute rinse with 5mL sterile water. Both sample types were mixed with Xpert SR buffer (0.75mL:1.5mL ratio) and tested at the clinical field site laboratory with Xpert Ultra. Thereafter, sputum samples were collected. TB cases were both sputum MGIT culture and Ultra (excluding trace) positive.
Results: Among symptomatic clinic attendees with TB (n=25), oral rinse sensitivity was 64.0% (95%CI: 44.5-80.0) vs. 32.0% (95%CI: 17.2-52.0) for facemask capture (McNemar p=0.0047). Specificity among 86 healthy controls was 100% (95%CI: 95.7-100) for both methods. In 6 asymptomatic TB cases identified through community screening, oral rinse sensitivity was 33.3% (95%CI: 9.7-70.0) vs. 16.7% (95%CI: 3.0-56.0) for facemask capture. Sensitivity of oral rinse and facemask capture among participants with sputum semi-quantitative Xpert Ultra graded medium/high (n=20) was 85.0% (95%CI: 64.0-95.0) and 45.0% (95%CI: 25.8-66.0), respectively; and for those graded very-low/low (n=11), 18.2% (95%CI: 5.1-48.0) and 0.0% (95%CI: 0.0-26.0), respectively.
Conclusions: Oral rinse sampling was more sensitive than facemask capture for pulmonary TB diagnosis by Xpert Ultra. Sensitivity appears higher among symptomatic individuals and those with higher sputum bacillary burden. These findings support further optimisation of oral rinse as a promising non-sputum diagnostic alternative for pulmonary TB.

TBS-EP638 Comparison of different chemicals as an alternative sputum liquefaction reagent to N-acetyl-L-cysteine with Sodium Hydroxide (NALC-NaOH)

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Mycobacterium tuberculosis (*Mtb*) infection continues to be a threat to millions of Filipinos, as one of the leading causes of death in the country. Sputum analysis, a valuable tool in diagnosing tuberculosis, continues to hinder molecular analysis due to its high viscosity and lumpy nature. N-acetyl-L-cysteine with Sodium Hydroxide (NALC-NaOH) is often used; however, it must be freshly prepared as it loses its activity rapidly in a solution.
We aim to find an alternative sputum liquefaction reagent that is cost-effective, has fewer preparation requirements, and eliminates the need to be freshly prepared. This study tested seven chemicals, namely hydrogen peroxide (H2O2), trisodium phosphate (TSP), guanidine thiocyanate (GuScn), dithiothreitol (DTT), sodium hydroxide with sodium dodecyl sulfate (NaOH-SDS), water (dH2O) and NALC-NaOH as negative and positive controls.
We prepared a 15 mL artificial synthetic sputum from porcine mucin spiked with *Mycobacterium smegmatis* to avoid the risks of handling *Mtb*-positive samples. Each chemical was added to create a 1:1 ratio setup and performed in triplicate.
The tubes were observed at 0, 10, 20, and 30 minutes before and after adding chemical treatments. The viscosity of the solutions was rated with '++++', '+++', '++', and '+' for most viscous to least viscous. Viscosity was also measured with a rotational viscometer.
A statistical analysis of the comparison of chemicals at time 30 was performed. Against the Control (no added liquefaction reagent), only NALC-NaOH and GuSCN were significantly less viscous ($p < 0.05$).
Comparison of timepoints, not accounting for the chemicals, was also performed. Viscosity readings of times 20 and 30 were found to be highly significant from Time 0 ($p < 0.001$) and significantly different from Time 10 ($p < 0.05$). NALC-NaOH yielded the lowest viscosity value. GuScn presents promising results as a substitute for NALC-NaOH in the molecular analysis of sputum.

TBSCIENCE UNMODERATED E-POSTERS

TBS-EP362 Toward entropy-based precision monitoring of tuberculosis: A systematic review of immune dysregulation as a predictive framework for treatment innovation

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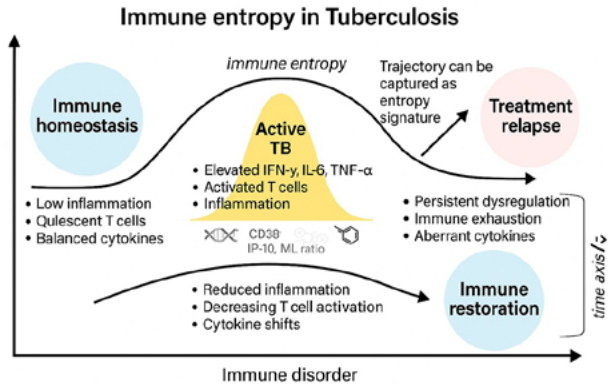
Background: Tuberculosis (TB) progression reflects not just bacterial persistence but a dynamic collapse of immune system order — a phenomenon conceptualized as rising biological entropy. Current treatment monitoring, reliant on sputum culture conversion, poorly captures the host immune state and overlooks the systemic destabilization underpinning poor outcomes.
This systematic review integrates evidence from immunology, systems biology, and complexity theory to propose immune entropy as a unifying predictive framework for TB treatment monitoring and precision intervention.
Methods: We systematically reviewed studies from 2000 until 2025 measuring immunologic, transcriptomic, and metabolomic biomarkers across TB infection states and treatment courses, via searches of PubMed, Embase, and Web of Science. Eligibility required linkage of immune markers to clinical trajectories: progression, treatment response, relapse, or mortality. Data were synthesized to map trajectories of immune order versus disorder.
Results: Progression from latent TB to active disease consistently aligned with surges in inflammatory signals (IP-10, IL-6), elevated T-cell activation (CD38+, HLA-DR+, Ki-67+), dysregulated monocyte/lymphocyte ratios, and IFN-driven transcriptomic shifts.
Successful treatment reversed these signatures, restoring immune equilibrium. Persisting dysregulation despite therapy predicted relapse and death. Integrating multiscale biomarkers suggests the feasibility of constructing "entropy signatures" — composite immune state maps that anticipate individual treatment trajectories earlier and more precisely than sputum-based measures.
Conclusions: Reframing TB treatment response through an entropy lens reveals actionable opportunities: to design dynamic, individualized treatment strategies based on immune system stability, not bacterial detection alone. Developing and validating entropy-driven models — potentially enhanced by AI and systems immunology — could revolutionize TB therapeutic monitoring, shortening trials, accelerating cure prediction, and preventing drug resistance emergence. This visionary paradigm urges a shift from static microbiological endpoints toward dynamic, host-centric monitoring frameworks.



TBS-EP365 Machine learning models reveal predictive signatures of therapy outcome in Phase 3 TB trials

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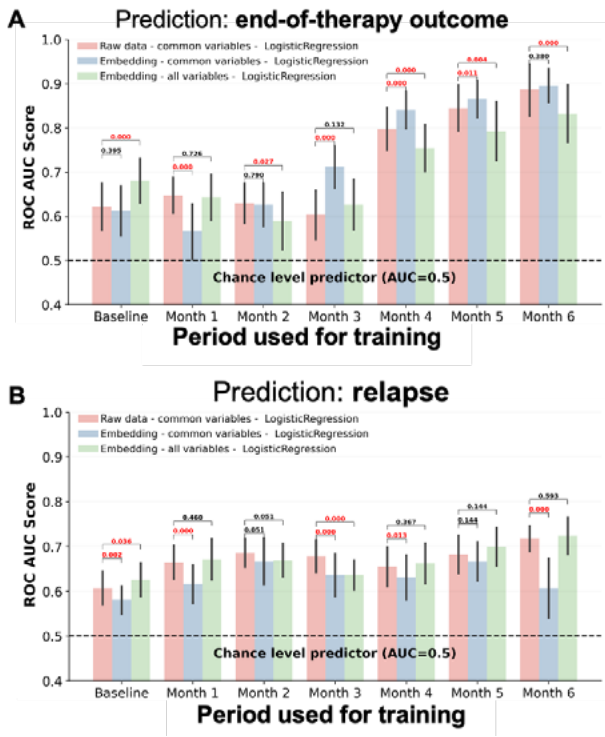
Early identification of tuberculosis (TB) patients at risk of unfavorable end-of-therapy (EOT) outcomes or relapse remains a major clinical challenge. To address this, we analyzed data from the REMoxTB and OFLOTUB Phase 3 trials to predict both EOT outcomes and post-treatment relapse, restricting the relapse analysis to patients with a favorable EOT response. We also aimed to identify the key clinical features driving predictive performance.
First, we trained machine learning models routinely utilised in clinical predictions (logistic regression and XGBoost) on our clinical and treatment-related variables, employing a sliding-window prediction strategy of progressively incorporating data from baseline to each month of the six-month therapy period.
For EOT outcome prediction (Panel A), model performance (ROC-AUC) remained stable between baseline and Month 3 (0.60–0.65), then improved from Month 4 onward (0.80–0.90).
In contrast, relapse prediction showed fluctuating performance (Panel B), peaking at Month 2 (0.69) and Month 6 (0.72). Model performances were compared using 25x5 cross-validation, with paired t-tests and Benjamini-Hochberg correction. SHAP value analysis identified male sex, older age, drug adherence, and sputum test results (particularly LJ culture) as top predictors of EOT outcome. For relapse, male sex, older age, Ziehl–Neelsen staining, and symptoms such as cough and chest pain were most informative.



In addition, we leveraged a large language model (LLM)-based approach using two configurations: one embedding data from the latest visit, and one embedding all visits up to each cutoff. For EOT prediction, the last-visit LLM matched or outperformed models trained on raw variables (Panel A, blue bars); for relapse, the all-visits LLM setup performed comparably but not better (Panel B, green bars). These findings suggest that LLMs can effectively leverage sparse, sequential inputs for complex outcomes like relapse, while simpler, static representations suffice for more immediate outcomes such as EOT.

TBS-EP368 The use of unmanned aerial vehicles (UAV) on delivering biological samples for tuberculosis and COVID-19 diagnosis: A scoping review

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Background: Although the evolution of laboratory techniques for diagnosing tuberculosis (TB) and other transmissible lung diseases, such as COVID-19, is accelerating, populations in remote and hard-to-reach areas often face delays in diagnosis due to logistical challenges in delivering samples to laboratories. Among the potential solutions for this reality, using unmanned aerial vehicles (UAVs), commonly known as drones, for transporting laboratory samples has been evaluated in various scenarios worldwide.
Purpose: To identify and review scientific evidence from experimental studies utilizing UAVs to transport samples for the diagnosis of TB and COVID-19. This exploratory study aims to support the future development of UAVs for transporting biological samples within the Brazilian Unified Health System (SUS).
Methods: This scoping review defined its eligibility criteria using the PECO acronym, focusing on: **P**opulation: biological samples for diagnosing COVID-19 or TB; **E**xposure: UAV transportation; **C**omparator: land transportation; **O**utcomes: Cost, effectiveness, methods for sample preservation, flight parameters (time, altitude, speed, distance), and quality of transported samples. Eligible studies were identified through searches in Medline via PubMed, Scopus, Embase, and Web of Science. Grey literature was explored via Google Scholar.
Results: Of the 2,052 articles initially found, 797 were duplicates. From the 1,255 remaining, 1,247 were excluded after title and abstract screening. Eight articles were retrieved for full-text review, of which five met the eligibility criteria and were included in the review. These studies provided diverse evidence regarding cost, operational performance, safety, and sample integrity.

Conclusion: The review demonstrated promising applications of UAVs in healthcare logistics. However, regulatory and legal frameworks require adaptation to ensure operational safety. Further experimental studies are necessary, particularly involving beyond visual line of sight (BVLOS) operations, to evaluate scalability and potential cost reductions.

TBS-EP371 Evaluation of an oral bedaquiline regimen for treating multidrug-resistant TB in China: A randomized trial

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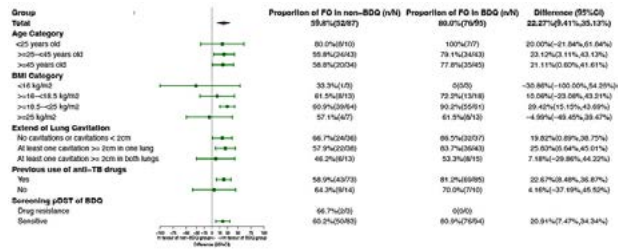
Background: The efficacy and safety of a bedaquiline (BDQ)-containing oral short-course regimen (SCR) in Chinese population remains unvalidated in large-scale clinical trials. Therefore, the Pragmatic Randomized Controlled Trial to Evaluate the Efficacy and Safety of an Oral SCR Including BDQ for the Treatment of Patients with Multidrug-resistant Tuberculosis (MDR-TB) in China(PROSPECT study) was conducted.
Design: We conducted a randomized, non-inferiority, open-label trial at 17 hospitals, targeting adult pulmonary MDR-TB patients. Participants were assigned in a 1:1 ratio to receive either a 40-week oral BDQ-containing SCR or a non-BDQ-containing SCR. The primary endpoint was the proportion of favorable outcome(three consecutive negative cultures for *Mycobacterium tuberculosis* without prior unfavorable outcomes) at Week 40.
Unfavorable outcomes included treatment discontinuation, death, lost follow-up, major treatment change, treatment extension, and bacteriological failure. The non-inferiority of the difference in proportion between the BDQ-group and control group in the modified intent-to-treat population (mITT) was set at -15%.
Rates of modified favorable outcome (two consecutive negative cultures without prior unfavorable outcomes) and cured status(WHO criteria) in both groups were also evaluated.
Results: A total of 217 participants were randomized and took at least one dose of study drug, with 182 included in the mITT population. By Week 40, 76(80.0%) of 95 participants in the BDQ group, and 52(59.8%) of 87 participants in the control group achieved favorable outcomes, with an adjusted (site, lung cavitation) difference of 22.27% (95%CI, 9.41% to 35.13%), indicating the non-inferiority of BDQ-containing SCR.
The main reason for unfavorable outcomes was treatment discontinuation (16.8% in BDQ vs. 32.2% in control). Higher rates of modified favorable outcomes (80.0% vs. 59.8%) and cured status (80.0% vs. 58.6%) were also observed in the BDQ group. No new safety signal was identified during the allocated treatment phase.



Conclusion: The 40-week BDQ-containing SCR demonstrated efficacy and tolerability, presenting a viable treatment option for MDR-TB patients in China.

TBS-EP374 Treatment outcomes and risk factors among tuberculosis patients infected with *Mycobacterium tuberculosis* Beijing lineage in Ukraine (2020–2023)

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Objective: To evaluate the association between infection with *Mycobacterium tuberculosis* (MTBC) strains of the Beijing lineage (L2) and clinical outcomes, comorbidities, and risk factors among tuberculosis (TB) patients in Ukraine.
Methods: We conducted a nationwide study of patients with culture-confirmed pulmonary TB across 18 of Ukraine‘s 24 regions between 2020 and 2023.
Whole-genome sequencing was performed on DNA extracted from 4,332 MTBC strains using Illumina paired-end platforms. MTBC lineages (L) and genotypic resistance profiles were determined via the bioinformatic pipeline MTBseq. Data were stored in the NIAID Ukraine TB-Portals database.
Results: Infection with a L2 strain was identified in 3,028 (69.9%) patients, while L4 strains where found in 1,302 (30.0%) cases. Single strains belonged to Lineage 3 and *M. bovis* (0.1%).
Lineage 2 was disproportionately represented among multidrug-resistant tuberculosis (MDR) / pre-extensively drug-resistant / extensively drug-resistant (XDR-TB) cases (2,649/3,028;87.5%), whereas Lineage 4 predominated in drug-susceptible or non-MDR\ (rifampicin-resistant) RRTB cases (781/1,302;59.9%)(p≤0.001).

Unfavorable treatment outcomes (treatment failure, death) were significantly more frequent among patients with L2 (713/3,028;23.5%) compared to L4 (231/1,302;17.7%) (OR=1.4; 95% CI:1.2–1.7;p≤0.001).
Independent predictors of poor treatment outcomes among patients infected with L2 included:
Tobacco use (OR=1.6;95% CI:1.3–1.8;p≤0.001),
Homelessness (OR=1.6;95% CI:1.1-2.3; p≤0.001),
Injection drug use (OR=2.2;95% CI:1.6-2.9;p≤0.001),
Previous incarceration (OR=1.8;95% CI:1.3-2.4;p≤0.001),
HIV co-infection (OR=1.8;95% CI:1.5-2.2;p≤0.001),
Hepatitis B (OR=2.4;95% CI:1.1-4.8;p=0.005),
Hepatitis C (OR=1.7;95% CI:1.3-2.3;p≤0.001),
Anemia (OR=1.5;95% CI:1.3-1.8;p≤0.001).
Conclusion: Our findings highlight the widespread dominance of the Lineage 2 in Ukraine and its strong association with drug resistance and adverse clinical outcomes. The presence of comorbid conditions such as HIV, viral hepatitis, substance use, and social vulnerabilities further compounds the risk of unsuccessful treatment.
These results underscore the urgent need for a better understanding of MTBC lineage effects on TB treatment efficacy and intensified care models targeting high-risk populations in Eastern Europe.

TBS-EP377 Addressing tobacco industry tactics in university campuses and its impact on tobacco cases in Iraq

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Addressing tobacco industry tactics on university campuses in Iraq is a crucial step toward reducing tobacco use among youth and young adults—a population particularly vulnerable to industry marketing and misinformation. University students represent a significant portion of future healthcare professionals, educators, and policymakers, making them key agents of change.
By implementing strict anti-tobacco policies and countering industry influence within academic institutions, Iraq can reduce smoking prevalence, thereby decreasing TB incidence and improving overall public health outcomes. This research adopted a mixed-methods approach, combining qualitative and quantitative techniques to comprehensively examine tobacco industry interference in public universities across Iraq.
The study was conducted across seven major public universities strategically selected to reflect geographic, demographic, and institutional diversity. This ensured the findings captured variations in tobacco control enforcement and exposure to industry tactics. The document analysis showed that four out of seven institutions had active or passive partnerships with the tobacco industry, often disguised as cultural or student events.
Stakeholder interviews confirmed these findings, highlighting limited awareness among faculty and student leaders about tobacco industry tactics. Institutions with higher levels of interference showed weaker policy enforcement and higher student smoking rates. This pattern correlates with an increased risk of TB transmission, as tobacco use is a well-documented risk factor for both TB infection and disease progression, especially in dense, poorly ventilated university environments.
The study concludes that tobacco industry interference remains a pervasive issue in Iraqi public universities, with significant gaps in the enforcement of WHO FCTC Articles 5.3 and 8. This interference not only promotes tobacco use among students but also indirectly contributes to the increased risk and burden of tuberculosis (TB), especially in densely populated academic settings.
Universities with weaker tobacco control measures exhibited higher exposure to industry-sponsored events and student smoking prevalence. To address these challenges.

TBS-EP380 Breath-based pathogen detection technologies for diagnosing respiratory infections: A scoping review

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Background: Accurate and rapid diagnostics could reduce the burden of respiratory infections and antimicrobial resistance. However, conventional respiratory sampling has limitations. Sputum is difficult to collect and variable in availability and sample quality. Upper respiratory tract swabbing has lower sensitivity for lower respiratory tract pathogens. Exhaled breath is a promising sample that enables direct pathogen detection, while potentially providing insights into infectiousness.
This review maps the rapidly evolving landscape of technologies for breath sampling and direct pathogen capture and/or detection, detailing their underlying methodologies, use cases, technological gaps, and diagnostic accuracy.
Methods: We searched MEDLINE, Embase, and Web of Science for pre-clinical and clinical studies utilizing exhaled breath aerosol or condensate for pathogen capture and/or detection. We excluded studies without data from contrived and/or clinical samples and studies reporting solely on volatile organic compounds (VOC)-based

detection. Two reviewers are performing title/abstract screening followed by full-text screening, discrepancies will be resolved through consensus or consultation with an additional reviewer. Data extraction will be conducted by a single reviewer, followed by verification by a second reviewer. Missing data will be addressed by searching grey literature sources.

Results: 5600 titles were identified for screening based on our search strategy. A pilot screening of ten studies reveals diversity in sample collection devices (for e.g. face masks, mouthpieces, and straws) and collection methodology (breathing technique and duration). Findings will be categorized by device characteristics, collection and detection methodology, diagnostic performance, use case, and operational considerations. A narrative summary will be included to highlight trends, strengths and weaknesses, and areas for further research.

Conclusion: Exhaled breath sampling holds promise as an accessible and accurate detection of respiratory infections. This review will offer an overview of breath-based pathogen detection technologies, highlighting their diagnostic potential and readiness for clinical adoption.

TBS-EP383 Leveraging artificial intelligence driven mobile X-ray screening on TB detection in high-risk brick Kiln communities of Punjab, Pakistan

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Summary: A 2024 study in Punjab, Pakistan, utilized AI-enhanced mobile X-ray screening to detect tuberculosis (TB) among brick kiln workers, revealing a prevalence of 1.17%, significantly higher than national averages. This research highlights the critical need for targeted TB interventions in high-risk occupational groups and demonstrates the potential of AI in advancing TB diagnostics and treatment strategies.

Background: Tuberculosis (TB) remains a major public health challenge in Pakistan, with an incidence of 277 per 100,000 population in 2023 [1]. Brick kiln workers, exposed to silica dust and poor ventilation, face amplified TB risks but are not classified as high-risk under current policies. In diagnostics, AI-powered tools like Computer-Aided Detection for TB (CAD4TB) have shown high accuracy in identifying TB from chest X-rays, making them valuable for active case finding in resource-limited settings [2].

Design/Methods: In 2024, a mobile X-ray screening initiative was conducted in Punjab, Pakistan, targeting brick kiln workers. Using mobile X-ray vans equipped with CAD4TB, 53,188 brick kiln workers were screened. Individuals with abnormal radiographs underwent GeneXpert MTB/RIF testing. Comparative data were collected from 78,560 individuals screened in general community hotspots using similar methods.

Results: The study found a TB prevalence of 1.17% (624/53,188) among brick kiln workers, which is 4.2 times higher than the national incidence (0.28%) and 4.5 times higher than the provincial average (0.27%).

In comparison, community hotspots showed a prevalence of 1.40% (1,100/78,560). Brick kiln workers had a higher diagnostic yield, with 18.7% GeneXpert positivity compared to 22.0% in hotspots.

Metric	Brick Kiln Workers	Community Hotspots	National Incidence (Pakistan)	Provincial Incidence (Punjab)
Sample Size	53,188	78,560		
TB Prevalence	1.17% (624 cases)	1.40% (1,100 cases)	0.28%	0.27%
Gene Xpert Positivity Rate	18.7%	22.0%		
Prevalence vs National Incidence	4.2x higher	5.0x higher		

Conclusions: This study underscores the effectiveness of AI in TB diagnostics for high-risk populations and advocates for the reclassification of brick kiln workers as a high-risk group. Moreover, it illustrates the broader potential of AI in TB research, from optimizing treatment regimens to accelerating the discovery of new drugs and vaccines.

TBS-EP386 Drug resistance detection from swab samples - A proof of principle pilot study using Molbio Truenat MTB-RIF-Dx and MTB-INH assays

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Background: Many patients at high risk for tuberculosis (TB) and drug resistance cannot produce sputum, thus alternative sample types are a World Health Organization research priority. While new, near point-of-care swab-based tests for Mycobacterium tuberculosis (MTB) detection are emerging, approaches for drug susceptibility testing (DST) on these samples remain unexplored. This pilot study aimed to establish proof-of-principle for detecting drug resistance from swabs using the Truenat MTB-RIF-Dx and MTB-INH prototype assays (Molbio Diagnostics, India), designed for sputum-based rapid diagnosis of resistance to rifampicin and isoniazid.
Methods: The study was conducted in the Philippines and included 50 paired swab samples from 25 patients with drug-resistant TB, one frozen tongue swab and one sputum swab prepared from frozen raw sputum per participant. Presence of MTB and resistance to rifampicin and isoniazid were confirmed with culture and phenotypic DST from sputum using the BACTEC MGIT 960 system (Becton Dickinson, USA). All participants had rifampicin-resistant TB, 15/25 had isoniazid-resistant TB. All samples were tested with Truenat MTB Ultima for MTB detection. MTB-positive samples were subsequently tested with MTB-RIF-Dx and MTB-INH. Indeterminate results were repeated once.
Results: Truenat MTB Ultima detected MTB in 20/25 (80.0%) tongue swabs and 25/25 (100.0%) sputum swabs. Sensitivity for rifampicin resistance detection was 91.7% (11/12, 95% CI 61.5-99.8) for tongue swab and sputum swab samples. Sensitivity for isoniazid resistance detection was 100.0% (6/6 95%CI 54.1-100.0) for tongue swabs and 90.9% (10/11, 95%CI 58.7-99.8) for sputum swabs. Proportions of indeterminate test results ranged from 40.0%-45.0% in tongue swab testing and 36.0%-52.0% in sputum swab testing. 29/39 (74.36%) indeterminate results occurred in samples with low bacillary load (see table).

	TP	TN	FP	FN	Indeterminate Low bacterial Load[a]	Indeterminate High bacterial Load[b]	Total (N)
Tongue swab - MTB-RIF-Dx	11	0	0	1	7	1	20
Tongue swab - MTB-INH	6	4	1	0	9	0	20
Sputum swab - MTB-RIF-Dx	11	0	0	1	7	6	25
Sputum swab - MTB-INH	10	5	0	1	6	3	25

[a] cycle threshold values ≥25 on MTBUltima [b] cycle threshold values <25 on MTBUltima
TP true positive TN true negative FP false positive FN false negative

Conclusion: Our findings support the feasibility of detecting drug-resistance from swab samples. Further research on reducing indeterminate results by optimizing assay design for swab samples should be pursued, given the need for non-sputum-based diagnostics.

TBS-EP389 AI-powered TB screening revolution: Impact of CAD4TB and DELFT portable X-ray machines in Punjab, Pakistan

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Introduction: Tuberculosis (TB) remains a global health challenge, necessitating innovative diagnostic solutions. Under the theme Artificial Intelligence Advancing the TB Field, Punjab, Pakistan, implemented a pioneering AI-driven TB screening program in 2024, leveraging 37 DELFT Imaging Portable X-Ray Machines integrated with CAD4TB software.
This initiative aimed to enhance early case detection and Tuberculosis Preventive Treatment (TPT) uptake in resource-limited settings.
Methods: In 2024, Punjab deployed 37 DELFT Portable X-Ray Machines across urban and rural communities, conducting 80,000 chest X-rays. The CAD4TB software, utilizing deep learning algorithms, analyzed X-ray images for TB-specific abnormalities, enabling rapid and accurate diagnosis. Screening targeted the general population, a first in Punjab, with data compared to 2023 (256,000 TB cases, no AI screening) and 2024 (290,000 cases). TPT enrollment was tracked, rising from 27,433 (9% of cases) in 2023 to 36,610 (11%) in 2024. Data were analyzed for case detection rates, TPT uptake, and diagnostic accuracy.
Results: The program achieved a 13.3% increase in TB case detection (290,000 vs. 256,000) and a 33.3% rise in TPT enrollment, driven by CAD4TB's high sensitivity (AUC > 0.90). The table below summarizes outcomes. Community-based screening overcame logistical barriers, enhancing access and reducing diagnostic delays.

YEAR	TB CASES REPORTED	CAD 4 TB X-RAYS CONDUCTED	TPT ENROLLMENT (RATE)
2023	256,000	Nil	27,433 (9%)
2024	290,000	80,000	36,610 (11%)

Table: TB Screening and TPT Outcomes in Punjab (2023–2024)

Conclusion: This AI-driven initiative demonstrates scalability and precision, offering a replicable model for global TB control. The accompanying image illustrates a DELFT X-Ray Machine in a Punjab health camp, highlighting AI's transformative impact.

TBS-EP392 Validation of a rapid point-of-care chromatographic test for screening TB cases in immunocompetent patients – Pilot study

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Tuberculosis is a public health problem, with high morbidity and mortality rates worldwide. Improving access to early and rapid TB diagnosis is one of the main factors against active TB, since conventional diagnosis has several limitations. The Lateral Flow Assay for detection of LAM (lipoarabinomannan) represents a promising tool to fill the gap on TB diagnosis. It is rapid, point-of-care and cost-effective test available to screening TB in urine. Commercial LAM tests are indicated for use in immunocompromised patients (Alere LAM-TB test, Abbott).
This study evaluated the accuracy of rapid lateral flow immunochromatographic test as a point-of-care screening strategy in immunocompetent patients.
The „One-Step Tuberculosis-LAM-Antigen-Detection Test" (LAM-TB Test), from India, was used in adults with suspicion of pulmonary-TB. Patients from both sexes, coming from outpatient clinics or wards of Public Reference Health Services for TB of Brazil, Pernambuco, followed prospectively and double-blinding manner. Tests were performed at FIOCRUZ-Pernambuco, between January and June 2024. The statistical analysis were done on SPSS 20.0 and OpenEpi: accuracy, sensitivity (Se), specificity (Sp), predictive values (PV).
A total of 191 patients, whose 70.2% were male, with age ranged from <18 to >70 years old were tested by LAM-TB Test, on urine. Compared to Gene-Xpert, considering only negative-HIV patients (*n*=162), the accuracy of LAM-TB test was 65.4% (CI=57.8-72.3), Se=53% (CI=42.5-63.4); Sp=78.5% (CI=68.2-86.1); PPV=72.1% (CI=59.8-81.8) and NPV=61.4% (CI=51.4-70.3). Including all patients (with and without HIV), positivity of LAM-TB was 38.2% (n=74). WHO recommends the Alere LAM-TB test for HIV positive patients, whith Se=42% (95%CI=31–55), however, it's not recomend for HIV-negative patients due to its low sensitivity (Se=17.5%).
One-Step-LAM-TB is a screening poin-of-care test with accuracy over 65% on immunocompetent patients, is an advantage over recommended test by WHO, which has a poor Se on this group of patients using a non-invasive sample, adding comfort and practicality.

TBS-EP395 Preventive practices of pulmonary tuberculosis in Chitwan districts

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Background: Tuberculosis (TB) is one of the world's most serious infectious diseases caused by Mycobacterium tuberculosis. Tuberculosis typically attacks the lungs, but can also affect other parts of the body. The disease has become rare in high income countries, but is still a major public health problem in low- and middle-income countries. According to the World Health Organization (WHO), one-third of the world's populations are infected with TB. Each year, there are over nine million cases of TB and almost 1.8 million TB-related deaths worldwide. Furthermore, TB is one of the leading causes of death in HIV-infected people.
Methods: Analytical cross- sectional study design was using to preventive practices of tuberculosis patient in Chitwan districts, This study was Quantitative method. Study population of this study was suffering from tuberculosis and taking Anti-TB medicine from different DOTS center of Chitwan. Patents who were taking anti-TB drugs from different DOTS centers were the study population.
Results: In this study showed that the practice of the 36.4% respondents had poor practice and 63.6% had good practice.

Variables	Frequency(%)
practice for sputum disposal before**	
Indiscriminate spitting	222(78.4)
Using paper/handkerchief	57(20.1)
Disposing in dustbin/waste	32(11.3)
practice for the disposal of sputum now	
Indiscriminate spitting	73(25.61)
Using paper/handkerchief	90(31.5)
Disposing in dustbin	79(27.7)
Burning	54(18.94)

Conclusions: This study concludes that the majority of the respondents who are male by gender, low economic class (janajati), and whose religion is Hindu, had a high prevalence of tuberculosis. The burden of tuberculosis is

high among labour and joint types of families. The majority of respondents had pulmonary tuberculosis. A tuberculosis cause was found by examination. The majority of the respondents have heard about tuberculosis and the majority of the respondents asked about pathogenic organisms which cause tuberculosis.

TBS-EP398 Genetic pattern of the ST 61 cluster of the Cameroon family among *Mycobacterium tuberculosis* complex strains collected during the CANTAM I project in Cameroon

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Background: Tuberculosis (TB) remains an outstanding diseases in global health concern. Caused by Mycobacterium Tuberculosis Complex (MTBC) strains. ST 61, a cluster of the LAM10_CAM family has been shown to be the most prevalent cluster implicated in TB transmission in Cameroon.
Objectives: We aimed at revealing the most discriminative loci applied to this cluster and investigating the genetic pattern in the ST 61 cluster samples.
Methods: A cross sectional study of 12 months (between October 2019 and January 2020) that included 45 randomly selected clinical specimens previously collected during the CANTAM 1 project. DNA extraction, amplification of 12-locus Mycobacterial Interspersed Repetitive Unit-Variable Tandem Repeat (MIRU-VNTR) analysis of each locus (MIRU 40, ETR A, QUB 26, Mtub 39, QUB 4156, MIRU 26, MIRU 31, MIRU 16, MIRU 02, MIRU 04, MIRU 23, and MIRU 27), PCR assay and gel electrophoresis performed. The amplicon sizes, the allele assignations, the allelic pattern and the technic discriminative potential were determined using MIRU-VNTR plus web application and a dendogram was generated.
Results: All the 45 isolates of clade ST61 where analyzed with MIRU/VNTR typing and detected 26 different patterns (Haplotypes). Comprising 11 sub clusters formed by 30 isolates and 15 unique patterns formed by 15 isolates (Orphans).
Reported 45% genetic pattern, and 66,6% clustering rate. Loci MIRU 4, 16, 23, 27 and ETRA were highly discriminative.Loci MIRU 40 and QUB 4156 were moderately discriminative and loci MIRU 2, 26, 31, Mtub 39 and Qub 26 were poorly discriminative. ETR A, MIRU 4, MIRU 16, MIRU 23, MIRU 27 revealed as the most discriminating loci applied to the cluster ST 61.
Conclusion: The most discriminative locus ETRA, MIRU 4, MIRU 16, MIRU 23, and MIRU 27 applied to a precise cluster is a safe economic and time gain option to enhance the difference between strains at the cluster level.

TBS-EP401 SHIFTING paradigms in DR-TB management: Real-world outcomes of injectable Kanamycin vs. Bedaquiline all-oral regimens using Ni-Kshay surveillance data

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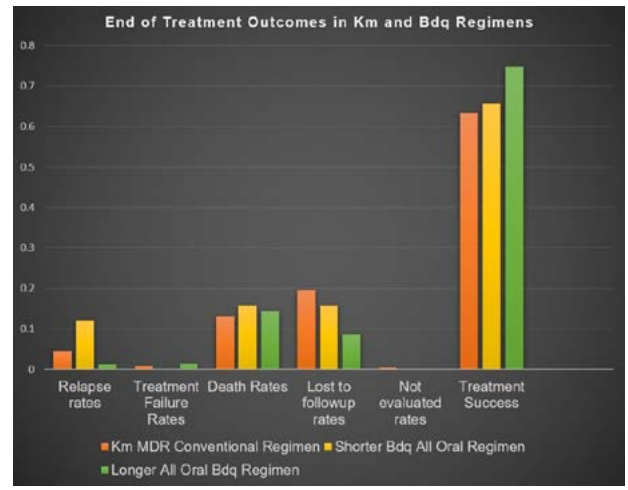
Background: This study extends our work presented at the Union World Conference on Lung Health 2024, with a revised methodology and reanalysis yielding distinct findings.
This study evaluates and compares the effectiveness of Kanamycin (Km) -based and Bedaquiline (Bdq) -based regimens while analyzing relapse timing and the influence of Gender, Diabetes and HIV.
Methods: Data from Ni-Kshay Version 2 (Byculla Region) was extracted. Of 13,407 patients screened (2018–2021), 1,672 rifampicin-resistant cases were identified and categorized into freshly diagnosed MDR and Pre-XDR/XDR groups. Data included demographics, treatment regimens, outcomes, comorbidities, and Binary Coded DST profiles. Statistical analysis was performed to compare relapse, treatment failure, death, lost to follow-up, and treatment success across regimens.



Results: ***Shorter Bdq vs. Km Conventional (MDR patients)****:*
Insignificant increase in relapse and death, no significant difference in treatment failure with Bdq
Slightly improved treatment success with Bdq (ARR = –0.0253; p = 0.7272)
Longer Bdq vs. Km Conventional (MDR patients)*:*
Significantly higher treatment failure (ARR = – 0.00534 ; $p = 3.13*10^{-135}$) with Bdq;
Diabetes (n = 26) and HIV (n = 49) both associated with higher deaths in Longer Bdq regimen.
Better outcomes with Bdq in MDR EPTB, but higher treatment failures than Km.

Males show similar treatment failure rates as females with Km, but higher failure with the Longer Bdq regimen. In contrast, females have higher relapse with Km and lower relapse with the Longer Bdq regimen compared to males.

Longer Bdq vs. Shorter Bdq:

Increased treatment success in Longer regimen (Not significant)

Pre-XDR/XDR vs. MDR on Longer Regimens:

Higher relapse and treatment failure with Pre – XDR/ XDR

All Bdq-based regimens showed earlier relapse trends vs. Km regimens with 50 % having relapse- timing of less than 6 months. (n = 15)

Conclusion: Effectiveness studies show mixed outcomes.

TBS-EP404 Analysis of the incidence of tuberculosis lung injury and related factors of lung function after cure of pulmonary tuberculosis: A prospective observational study

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Introduction: Post-tuberculosis lung damage (PTLD) refers to the residual pulmonary impairment following the completion of antituberculosis (TB) therapy, characterised by persistent respiratory symptoms and abnormal pulmonary function. The risk factors and biomarkers for PTLD have been scarcely investigated. More importantly, whether and to what extent cigarette smoking is involved in PTLD remain to be known.

Methods and analysis: This prospective observational study will enrol 400 male smoking or non-smoking patients aged 25–65 years, with newly confirmed active TB between 2022 and 2024, from the Department of Respiratory and Critical Care Medicine at Peking University Third Hospital and the Tuberculosis Department at Beijing Geriatric Hospital. Because females rarely smoke in China, we will enrol only males in this study.

Demographic data, smoking history and amount, clinical symptoms, lung function, and chest CT findings will be prospectively collected. Respiratory questionnaires, lung function measurements and chest CT examinations will be performed immediately after, and 1 year, 2 years and 3 years after the completion of TB treatment.

Peripheral blood samples will be obtained at baseline and at the end of anti-TB therapy, and a Luminex xMAP-based multiplex immunoassay will be used to measure inflammatory mediators and cytokines in serum.

The collected data will be analysed to determine the incidence and factors/ biomarkers of PTLD according to smoking status.

Ethics and dissemination: The study was approved by the Ethics Committee of Peking University Third Hospital (approval number: (2022)271-03; approval date: 8 June 2022). The research results will be disseminated through scientific and medical conferences and will be published in an academic journal.

TBS-EP407 Stool as an alternative diagnostic sample for TB in children under 14 years: Roll out study in Uganda

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Each year, 1.1 million children globally fall ill with tuberculosis (TB), of whom only 400,000 are notified with the case detection gap being highest in children aged under 5 years. Obtaining bacteriological confirmation of TB is challenging in children because of the frequent paucibacillary presentation of the disease. In children, it is complicated by difficulty in obtaining a quality specimen due to the hardship in sputum expectoration and the invasiveness of other procedures such as gastric aspiration. In 2021, the World Health Organization (WHO) recommended using stool as an alternative specimen type for TB diagnosis due to its user-friendliness combined with a sensitivity of 53% (95% CI: 35–70) and a specificity of 98% (95% CI: 93–99). This showed potential to close the pediatric TB diagnostic gap.

To introduce stool testing in Uganda, a phased early implementation approach was adopted from August 2023 to May 2024. These efforts saw 56 sites trained as trainers for the simple one-step (SOS) method. By the ninth month of implementation, 64 additional GeneXpert testing sites and 113 non-GeneXpert testing sites that routinely refer samples were further trained. Stool testing led to bacteriological confirmation of 124 patients in this period, giving a yield of 2.9%. A grand increase in the number of pediatric pulmonary bacteriologically confirmed (PBC) patients among all implementing sites increased by 6%. All SOS-negative patients were further screened clinically, leading to 22.1% (971/4397) getting started on childhood-friendly formulations.

The introduction of stool testing increased the number of confirmed TB cases among children and demonstrated its effectiveness in providing a definitive diagnosis. Scale-up and integration of the SOS technique within the routine diagnostic program of TB among children across the country is required to sustain and ensure universal access among all children in Uganda.

TBS-EP410 Human reader vs CAD4TB: Enhancing TB case detection through AI-supported mobile screening in Cambodia

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Background: Although Cambodia was recently removed from the WHO's list of top 30 high TB burden countries, tuberculosis (TB) remains a significant public health concern. In 2024, an estimated 54,000 TB cases occurred nationwide, yet only 33,769were officially notified—indicating a 37% detection gap. Addressing this gap remains critical to national TB control efforts.
Intervention: A mobile active case-finding (ACF) initiative was implemented across five operational districts in Cambodia. Village Health Support Groups (VHSGs) were trained to conduct community screening and refer presumptive TB cases to mobile diagnostic sites established at nearby health centers.
Participants underwent chest X-rays (CXRs), interpreted by both human readers (HRs) and computer-aided detection software (CAD4TB). Individuals with abnormal findings were subsequently tested using GeneXpert.
Results: Among 4,225 individuals screened with CXR, 773 were tested with GeneXpert based on HR assessments. Of these, 59% had CAD4TB scores ≥60 (173/294). The distribution of GeneXpert-confirmed TB cases by CAD4TB score bands was: 10–19.99 (1.9%), 20–29.99 (1.3%), 30–39.99 (7%), 40–49.99 (7%), 50–59.99 (5.7%), and ≥60 (77.2%).
CAD4TB identified 31 GeneXpert-positive cases that had been missed by HRs, spanning various CAD score ranges. This highlights CAD4TB's ability to recover missed cases and enhance diagnostic sensitivity. The GeneXpert positivity rate of 20% (158/773) also reflects efficient cartridge utilization when guided by CAD scoring.
Conclusion: CAD4TB demonstrated strong potential to complement human interpretation in TB screening, identifying cases that might otherwise be overlooked. Its integration into mobile ACF efforts can strengthen early detection, improve diagnostic efficiency, and contribute to narrowing the TB detection gap in high-burden and resource-limited settings such as Cambodia.

TBS-EP413 Tuberculosis recurrence prediction: A machine learning approach

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Tuberculosis (TB) continues to be one of the world's deadliest infectious diseases. Even after treatment, many patients face the risk of recurrence, which complicates recovery and puts additional burden on healthcare systems—especially in low-resource settings. The biological and clinical factors driving TB recurrence remain poorly understood, making early identification of high-risk individuals particularly challenging.
In this study, we used clinical data from the H56:IC31 vaccine Phase 2b clinical trial to explore whether machine learning can predict which patients are most likely to recur. The dataset comprised over 700 previously treated, TB-negative patients, with extensive demographic, clinical, and laboratory collected over one year.
One of the key challenges was the relatively low proportion of recurrence cases in the dataset (around 6% of all cases) —a common challenge in medical datasets where the outcomes of interest are rare but clinically significant. To address this, we applied machine learning techniques specifically designed for imbalanced data, including sampling strategies and evaluation metrics that prioritize sensitivity to rare events.
These approaches allowed to uncover subtle patterns across more than 200 clinical variables, which could be missed by the traditional statistical methods. By doing so, we explored the potential for predictive models to identify individuals at elevated risk of recurrence. The models achieved a mean AUC of 0.65 and PR AUC of 0.24, with a recall of 56% for identifying recurrence cases.
Moreover, the analysis points to specific clinical variables that may be most informative and deserve closer examination in future studies.
Our findings demonstrate that integrating clinical trial data with machine learning can guide long-term patient monitoring and inform next-generation TB vaccine design—unlocking value from clinical datasets that are often overlooked after primary trial analyses.

TBS-EP416 Bridging the knowledge gap: KAP assessment on tuberculosis among undergraduate health professional students in Baghdad with a focus on tobacco smoke and curriculum adequacy

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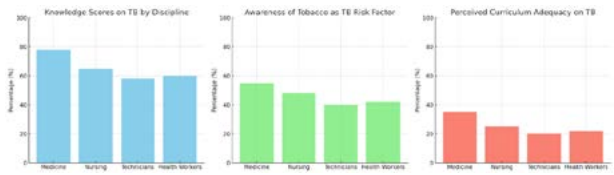
Background: Tuberculosis (TB) remains a persistent public health threat in Iraq, exacerbated by preventable risk factors such as tobacco smoke. Despite its national burden, limited data exist on future healthcare providers' knowledge, attitudes, and practices (KAP) toward TB and how adequately their undergraduate training prepares them to address it.
Objective: This study aims to evaluate the KAP regarding TB epidemiology, transmission, risk factors, especially tobacco smoke, and student perceptions of the sufficiency of TB content within the curricula of selected health professional colleges in Baghdad.
Methods: A cross-sectional study was conducted from October 2024 to July 2025 across four undergraduate health disciplines—Medicine, Nursing, Health Technicians, and Allied Health Workers—at Madenat Alelem University College. A validated structured questionnaire was administered to final-year students (n = 400).
The tool assessed core domains: (1) knowledge of TB epidemiology and risk factors, (2) attitudes toward TB patients and prevention, (3) clinical and public health practices, and (4) perceptions on curriculum adequacy.
Descriptive and inferential statistics were used to analyze findings, with subgroup comparisons by specialty and exposure to clinical TB training.
Results: Preliminary results indicate variable knowledge levels, with significant gaps in understanding tobacco smoke as a risk factor for TB. While most students recognized TB as a national concern, only 37% reported confidence in managing suspected cases.



Conclusion: The study highlights critical gaps in TB-related education among future healthcare providers in Iraq, particularly regarding tobacco-related risk and community prevention.
These findings suggest the urgent need for curriculum enhancement and interprofessional TB training tailored to national epidemiological priorities. Integrating tobacco control and community-based TB care into undergraduate education may strengthen Iraq's health system response to TB.

Keywords: *Tuberculosis, Iraq, KAP Study, Tobacco Smoke, Undergraduate Curriculum, Health Professional Education, Madenat Alelem University College*

TBS-EP419 Development and evaluation of hydrogel loaded with human amniotic membrane in wound healing

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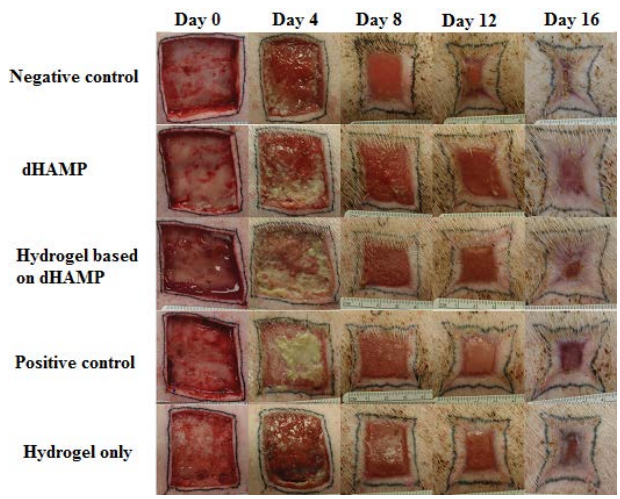
Introduction: The purpose of this study was the preparation and evaluation of the potential use of thermoresponsive hydrogels formulation for topical delivery using human amniotic membrane as a model drug substance.
Methodology: Cold method was used for the preparation of these temperature triggered thermoresponsive hydrogels formulations by varying the concentrations of the poloxamer 338 (P 338), poloxamer 188 (P 188) and pectin. In each formulation decellularized human amniotic membrane (dHAMP) concentration was 1% (w/v).
Each of these formulations were evaluated for sol-gel temperature and release of dHAMP. Sol-gel transition temperatures were within the range of 31-37°C for all the final formulations. Sol-gel transition temperature of F30 was altered by increasing the concentration of P 188 and brings it close to physiological temperature (37°C) by comparing the formulation with those formulations containing minimum concentration of P 188. Tube inversion method was used to analyze the effect of polymer concentration on the gelation behavior. Moreover wound healing activity and drug release behavior of these formulations were also evaluated.



Results: dHAMP release study of the formulations showed sustained release properties. Wound healing study showed significant results in group treated with hydrogels based on dHAMP when compared with other treated groups.

Group treated with hydrogels based on dHAMP showed complete healing and average re-epithelialization in 16 day with 73.5% healing. Fourier Transform Infrared Spectroscopy (FT-IR) and Differential Scanning Calorimetry (DSC) were performed to analyze dHAMP and polymer interactions. FT-IR spectra of the physical mixture showed the same bands as that of poloxamers and pectin indicating no interaction between poloxamers and pectin. However, FT-IR spectra of the formulations showed significant changes in bands which suggest the successful synthesis of hydrogels. DSC curve of physical mixture showed the same peak at 60°C for physical mixtures before and after addition of dHAMP.

TBS-EP422 Integrated surveillance of polio-negative AFP cases for childhood tuberculosis: A novel approach in Rivers State, Nigeria

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Background: Nigeria, certified free of wild poliovirus in 2020, continues nationwide acute flaccid paralysis (AFP) surveillance to detect potential polio-virus re-emergence. With tuberculosis (TB) remaining a leading cause of childhood mortality and under-diagnosis persistent in Nigeria, integrating childhood TB testing into AFP case investigations offers a novel strategy for pediatric TB detection. This study evaluates the yield of TB testing among polio-negative AFP cases under 15 years in Rivers State, Nigeria.
Methods: A retrospective analysis was conducted using AFP surveillance line-list data from January 2022 to March 2025. All children under 15 years with polio-negative AFP who were tested for TB using GeneXpert MTB RIF assay were included. Demographic and clinical variables were analyzed using descriptive statistics. Associations between TB positivity and sociodemographic factors were assessed using chi-square tests and logistic regression.
Results: A total of 118 AFP cases were tested for TB. The mean age was 3.6 years (SD ±3.25), with 76.3% under five years and 52.5% male. Five cases (4.2%) tested positive for TB, with no significant differences in TB positivity by sex (p=0.923) or age group (p=1.000). Logistic regression revealed no significant predictors of TB positivity, though most TB cases were under five years and presented with limb weakness, suggesting possible extra-pulmonary TB.
Conclusion: The integration of TB testing into AFP surveillance yielded a 4.2% TB detection rate among children under 15 with non-polio AFP, highlighting the potential of surveillance synergy. This innovative approach may help bridge the pediatric TB detection gap. Policymakers should consider adopting integrated protocols to maximize surveillance platforms and strengthen early case detection in high-burden settings.
Keywords: AFP, tuberculosis, polio surveillance, pediatric TB, integrated disease surveillance, Nigeria, Rivers State, case finding

TBS-EP425 Impact of discordant isoniazid and rifampicin susceptibility results between the Anyplex™ II MTB/MDR assay and the BACTEC MGIT 960 system on treatment decisions

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Background: Anyplex™ II MTB/MDR is a rapid diagnostic test used to detect Mycobacterium tuberculosis (MTB) and mutations associated with isoniazid (INH) and rifampicin (RIF) resistance. However, discordance with phenotypic drug susceptibility testing (DST) can complicate treatment decisions.
Materials and Methods: A retrospective review was conducted on patients with drug-susceptible TB (DS-TB), isoniazid mono-resistant TB (Hr-TB), rifampicin mono-resistant TB (RR-TB), and multidrug-resistant TB (MDR-TB) at King Chulalongkorn Memorial Hospital (KCMH), a tuberculosis referral center in Thailand, from 2018 to 2023.
The correlation between genotypic and phenotypic DST using the Anyplex™ II MTB/MDR and BACTEC MGIT 960 assays, respectively, was investigated from clinical specimens and MTB clinical isolates recovered from clinical specimens collected in the same period.
Results: Among 836 MTB isolates from 796 patients, 44 (5.2%) showed statistically significant discordant susceptibility to INH (p<0.001) or RIF (p=0.022). The majority of INH discordances (29 of 32, 90.6%) exhibited genotypic susceptibility but phenotypic resistance, while most RIF discordances (11 of 13, 84.6%) exhibited genotypic resistance but phenotypic susceptibility. The impact of these discordant results on clinical decision-making is summarized in Figure 1.

Among patients with discordant DST results, 52.2% were potentially undertreated, 2.3% were overtreated, and 40.9% had no change in treatment. Moreover, 6 of 11 genotypic-resistant/phenotypic-susceptible (G^R/P^S) RIF-discordant isolates harbored one of the following *rpoB* mutations: Leu430Pro, Asp435Tyr, or Leu452Pro, which are associated with low-level resistance. The susceptibility profiles and whole-genome sequencing results of these isolates are summarized in Table 1.

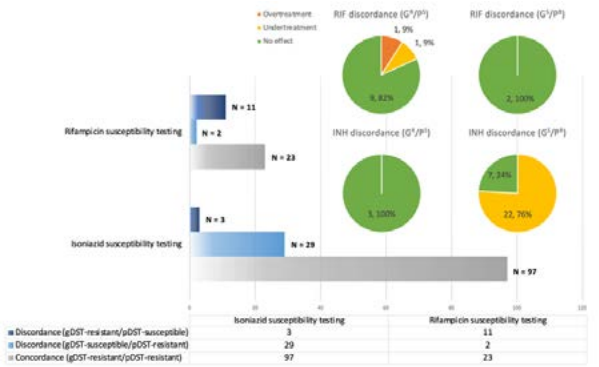

Figure 1. Isoniazid and rifampicin discordant results and their effect on physicians' treatment decisions.
Abbreviations: genotypic-resistant (G^R), genotypic-susceptible (G^S), phenotypic-resistant (P^R), phenotypic-susceptible (P^S).

Table 1. The susceptibility profile and WGS results of G^R/P^S rifampicin-discordant isolates

Isolate No.	TB treatment history	BACTEC MGIT 960 results	Anyplex™ II MTB/MDR results	WGS results using TB-Profiler v6.6.0	Strain lineage	RIF SNP using TB-Profiler v6.6.0	INH SNP using TB-Profiler v6.6.0	RIF MIC (mg/mL), susceptible (S) and resistant (R) classified according to the CRyPTIC consortium	INH MIC (mg/mL), susceptible (S) and resistant (R) classified according to the CRyPTIC consortium
MTBD13	Previously treated	Hr-TB	MDR-TB	MDR-TB	2.2.1	rpoB p.Leu430Pro	katG p.Ser315Thr	0.25, S	2, R
MTBD15	Previously treated	DS-TB	RR-TB	RR-TB	2.2.1	rpoB p.Asp435Tyr	None	2, R	1, R
MTBD22	Previously treated	DS-TB	RR-TB	RR-TB	2.2.1	rpoB p.Leu452Pro	None	1, R	<=0.03, S
MTBD26	Previously treated	DS-TB	RR-TB	DS-TB	2.2.1	None	None	0.12, S	<=0.03, S
MTBD28	Previously treated	DS-TB	RR-TB	DS-TB	2.2.1	None	None	0.12, S	0.06, S
MTBD31	New	Hr-TB	MDR-TB	MDR-TB	2.1	rpoB p.Leu430Pro	katG p.Ser315Thr	0.25, S	2, R
MTBD33	New	DS-TB	RR-TB	RR-TB	2.2.1	rpoB p.Leu430Pro	None	0.5, R	<=0.03, S
MTBD34	New	Hr-TB	MDR-TB	MDR-TB	2.2.1	rpoB p.Leu452Pro	katG p.Ser315Thr	1, R	2, R
MTBD40	Previously treated	Hr-TB	MDR-TB	Hr-TB	2.2.1	None	katG p.Ser315Thr	0.25, S	4, R

Conclusion: The Anyplex™ II MTB/MDR assay exhibited a substantial number of discordant results compared to the BACTEC MGIT 960 assay. These discordances may impact treatment decisions. Furthermore, certain cases of G^R/P^S RIF-discordant isolates were associated with borderline *rpoB* mutations, highlighting the need for careful interpretation of discordant results, as has also been reported for the Xpert MTB/RIF Ultra assay.

TBS-EP428 The role of physiotherapy in demystifying pulmonary tuberculosis in Uganda

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Background: In Uganda, profound cultural misconceptions have long linked Pulmonary tuberculosis to witchcraft resulting in delayed diagnosis, maltreatment stigma and isolation hence hindering effective management. Physiotherapy plays a dual role in this context through providing essential rehabilitative services to improve lung capacities and quality of life while serving as a critical platform for public education on the pathological origin of this condition.
Methods: With ethical approval and informed consent, a cohort study involving twenty-five persons (25) affected by pulmonary tuberculosis and their caregivers was conducted. Participants received three structured physiotherapy sessions per week for three months and a daily home exercise program. Data on lung function, quality of life, and stigma-related stress were collected at baseline and post-intervention. Perceived Stress Scale (PSS) were used for assessment of stigma related stress. Qualitative data on drug dosage adherence and well-being were analyzed thematically.
Results: The patient-caregiver support group that comprised of 25 patients and a sole care-giver for each had a retention rate of 75% over the 3 months of study which improved overall drug adherence. ($p < 0.5$).
Additionally self-reported reduction in isolation and stigma related stress calculated using the Perceived Stress Scale (PSS), decreased from 60% to 35% post intervention indicating psycho-social improvement. ($p < 0.5$).
Pulmonary function was measured using parameters such as Tidal Volume, Forced Expiratory Volume in one second (FEV_1) and exercise endurance. Quality of life improved by 30% using the SF-36 scale from 42 to 54.6 ($p < 0.5$).
Conclusion: These results highlight the potential of targeted rehabilitation and psychosocial support in addressing social challenges and demonstrate the effectiveness of physiotherapy interventions in improving clinical outcomes and emphasizing the pathological basis of pulmonary tuberculosis rather than moral failings and witchcraft which minimizes societal stigma thus increasing willingness of patients to seek and adhere to treatment.

TBS-EP431 Clinical performance of the CAD4TB AI system for pulmonary tuberculosis detection among young adults in Mongolia: A diagnostic screening study

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Background: Artificial intelligence (AI)-based diagnostic tools are increasingly integrated into tuberculosis (TB) screening workflows to improve early case detection, especially in underserved populations. In 2024–2025, Mongolia utilized the CAD4TB system—an AI-powered chest X-ray interpretation software—during military pre-enlistment health screenings for the first time.
This study evaluates the diagnostic yield and clinical relevance of CAD4TB in identifying pulmonary TB in young adults outside routine healthcare coverage.
Methods: Between September 2024 and May 2025, 6,231 individuals aged 18–25 years who were deemed medically unfit for military enlistment were screened using mobile CAD4TB units across two screening phases. Standardized chest X-rays were interpreted using the CAD4TB algorithm and individuals with high CAD scores were referred for confirmatory testing via molecular diagnostics (GeneXpert MTB/RIF). Clinical data, radiological scores, and test outcomes were analyzed to evaluate the diagnostic yield and profile of detected TB cases.
Results: During the pilot phase (Fall 2024), 2,086 individuals were screened, resulting in 7 bacteriologically confirmed pulmonary TB cases. In the national rollout (May 2025), 4,145 additional individuals were screened; CAD4TB flagged 169 (4.1%) for further testing, of whom 11 TB cases were confirmed (8 bacteriologically, 2 clinically, and 1 multidrug-resistant). Among all confirmed cases, 82% had infectious pulmonary TB. TB case detection was highest in 25-year-olds (36.4% of cases).
Overall, the study yielded 1.5 TB cases per 10,000 individuals screened. The CAD4TB system demonstrated efficient clinical identification of TB cases in an asymptomatic cohort with otherwise limited healthcare interaction.
Conclusion: This is the first clinical dataset from Mongolia evaluating the diagnostic performance of the CAD4TB system among young adults. The results support its clinical utility in early identification of both drug-sensitive and drug-resistant TB, highlighting its potential role in targeted TB screening strategies in low-prevalence, under-screened populations.

TBS-EP434 Addressing access to treatment and diagnostic barriers in TB treatment through the Market and Patent Intelligence Study: A focus on intellectual property barrier

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Background: Tuberculosis remains a major public health issue in Kenya with diagnostic and testing barriers contributing to delayed or missed treatments. Access to appropriate diagnostic tools is hampered by market inefficiencies, regulatory challenges and patent constraints.
Objective:
1. To identify the patent status of WHO-recommended TB treatment drugs.
2. To identify availability and barriers related to WHO-recommended TB diagnostics.
3. To evaluate the general market and patent landscapes affecting access to drugs.
4. To inform policy and procurement decisions.
Methods:
• Market Intelligence- Reviewed of Kenya's Procurement data for TB commodities and diagnostics.
• Patent Status- Assessed patent status of key TB drugs and diagnostic technologies through publicly available databases (Medspal, Espacenet, WIPO).
• Stakeholder interviews with Government procurement agency (KEMSA).
Findings:
1. High dependency on imports for TB drugs and diagnostics.
2. Patents currently are not an access barrier but supply chain, registration delays and procurement inefficiencies are.
3. Most adult anti-TB drugs in Kenya don't have patent barriers in Kenya due to bilateral agreements but other countries have Intellectual Property as barrier.
4. Regulatory bottlenecks delay the registration and roll out of newer TB diagnostic technologies.
5. Limited availability of WHO recommended diagnostics like Urine LAM and GeneXpert cartridges.
Recommendations:
1.Accelerate registration and policy adoption of new TB diagnostics.
2. Improved forecasting and procurement planning for consistent supply- use of AI.
3. Leverage TRIPS flexibilities when patents become a barrier especially because Kenya has been elevated to a Middle-Income Country where they may be left out of bilateral licences
4. Strengthen local manufacturing and regional collaboration.
Conclusion: Market and patent intelligence study is a tool to identify and address barriers in TB Drugs and diagnostics access. Collaboration among policymakers,

regulators and procurement agencies is essential to ensure timely availability of TB commodities and diagnostic technologies in Kenya.

TBS-EP437 Tuberculosis Big Model (TBM): An integrated simulation framework

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Tuberculosis (TB) led global infectious-disease mortality in 2023, overtaking COVID-19 and underscoring gaps in the End-TB Strategy. Although ultraportable molecular diagnostics, sequencing-based resistance testing, novel drugs, shorter regimens, and nineteen vaccine candidates have emerged, no integrated tool yet projects the epidemiologic, economic, and life-course impact of implementation at scale. Existing models dissect single steps of the care cascade, ignore resistance dynamics, overlook post-TB morbidity, and assume fixed diagnostic performance.

To address these limitations, we are developing the Tuberculosis Big Model (TBM) - an open-source, modular, and extensible simulation platform that unifies four previously siloed domains into a single analytic engine:

1. Core model (natural TB history)
2. Drug-resistance model
3. Diagnostic model
4. Life-long post-TB sequelae model

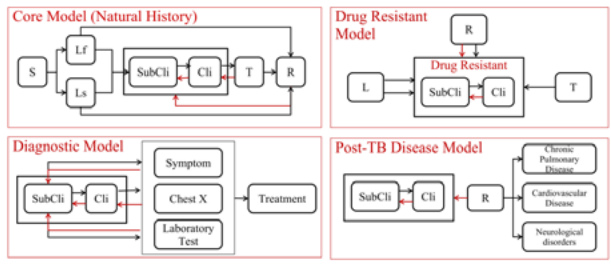
Core Model: Seven compartments represent the spectrum from uninfected to active disease. Flexible parameterization allows alternative assumptions regarding (1) progression or clearance of latent infection, (2) transmission within and between populations, and (3) recurrence after treatment, calibrated to epidemiologic data.

Drug-Resistance Model: Resistance emergence and transmission are captured through seven pathways across three stages representing both primary infection with drug-resistant strains and acquisition during treatment: (1) latent infection via mutation or sub-optimal chemoprophylaxis, (2) active treatment under inadequate regimens, and (3) post-treatment reinfection or reactivation of dormant resistant clones.

Diagnostic Model: Stratified into symptom screening, laboratory testing and chest radiography, the module (1) quantifies context-dependent sensitivity and specificity, (2) evaluates novel molecular platforms and AI-assisted image interpretation and (3) supports cost-effectiveness analyses of alternative algorithms.

Post-TB Sequelae Model: Post-TB morbidity is modelled separately from active or recurrent TB to reflect its distinct, long-term health burden. The framework incorporates excess risks for: (1) chronic pulmonary disease; (2) cardiovascular disease; (3) neurological disorders. Recurrent TB remains an explicitly modelled state within the core module, ensuring consistent linkage between active disease and subsequent sequelae.

A



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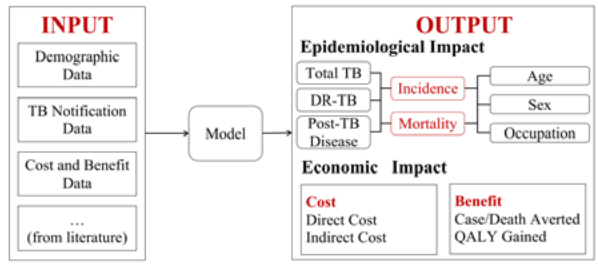

TBS-EP440 Shortened treatment regimens for drug resistant (DR)-TB patients in Azerbaijan: First results

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Background: Tuberculosis remains a serious problem in many countries. The fight against resistant forms of the disease is particularly difficult. Many patients, for various reasons, interrupt long and tedious treatment. Short therapy regimens help prevent such cases.

Objective: to analyze the first results of BPaL (Bedaquiline400/200, Pretomanid 200, Linezolid 600) and BPaL/M(Bedaquiline400/200, Pretomanid200, Linezolid 600/Moxifloxacin400) short treatment regimens for DR-TB patients in Azerbaijan.

Materials and methods: Since March 2024, the 346 DR-TB patients (aged from 15 to 55 y.o., 241 men, 105 women, and 13 adolescents (ads) <18y.o. among them) have been involved in new short treatment regimens.

BPaL 9-month treatment regimen implemented in 96 (8ads) preXDR-TB patients (1group), BPaL/M 6-month treatment regimen implemented in 250 (5ads) MDR-TB patients (2group).

Results: Currently, 185 patients continue to receive treatment. The treatment results of 161 patients were evaluated. Fully recovered 5 patients in 1 group and 25 patients in 2 group. Treatment was completed with residual elements in the lungs of 87 people (19 in 1, 68 in 2 groups). In these patients, bacterial shedding stopped in a shorter period of time (2-4 weeks), and the closure of the cavities in the lungs was observed. 5 and 13 people refused treatment, mortality was observed in 2 and 12 cases, unsuccessful treatment results without microbiological conversion and radiological dynamics were observed in 3 and 9 patients in groups 1 and 2, respectively.
The treatment caused temporary side effects, including peripheral neuropathy in 15(9.4%), myelosuppression in 102(63.4%), and QT interval prolongation in 9(5.6%) cases, but these were eliminated on time through careful monitoring
Conclusion: It is too early to properly compare BPaL and BPaL/M results, but the effectiveness of these shortened treatment regimens in the treatment of DR-TB patients was quite high at 72.7%(62% previous regimens). Also, shorter regimens increase patient adherence to treatment.

TBS-EP443 Concomitant subclinical pulmonary tuberculosis in patients with extra-pulmonary tuberculosis

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A cross-sectional study was conducted from May 2023 to October 2024 at the University College of Medical Sciences and Guru Teg Bahadur Hospital, Delhi. Sixty-two newly diagnosed EPTB patients above 12 years of age, without pulmonary symptoms, were enrolled. Each patient underwent chest X-ray (CXR), sputum testing (AFB smear, culture on LJ medium, Gene-Xpert MTB via CBNAAT), and contrast-enhanced CT (CECT) chest. Routine haematological, renal, liver, and inflammatory markers were analysed. Sociodemographic data and co-morbidities were recorded.
All 62 patients underwent CXR, sputum analysis, and CECT chest. Abnormalities on CXR were found in 59.7% of cases, with 17.7% suggestive of PTB. Sputum AFB smear was positive in 4.8% (3/62), Gene-Xpert in 3.2% (2/62), and culture in 0% of the patients. No rifampicin resistance was detected. CECT chest revealed findings suggestive of PTB in 38.7% (24/62) of cases.
Overall, 38.7% (24/62) of EPTB patients were diagnosed with concomitant subclinical PTB based on imaging and/or microbiological findings. Among all the diagnostic tools used, CT scan had the highest diagnostic yield. Subclinical PTB was more common among males, smokers, alcohol users, and individuals belonging to lower socio-economic strata.
Therefore, this emphasises the importance of early diagnosis, effective diagnostic & treatment protocols, strict guidelines implementation and appropriate screening practices to reduced the impact of pulmonary tuberculosis in an already existing pool of patients, especially in resource limited setup and population.

TBS-EP446 Evaluation of the second-generation Fujifilm SILVAMP TB-LAM assay for TB diagnosis in Nigerian adults

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Background: TB remains a major global health threat, with diagnostic challenges in low- and middle-income countries. The Fujifilm SILVAMP TB LAM (FujiLAM) assay was developed as a rapid urine-based test for TB diagnosis, but manufacturing inconsistencies in the first generation (v.1) led to the creation of FujiLAM (v.2).
This study evaluates the diagnostic performance and consistency of FujiLAM (v.2) compared to FujiLAM (v.1) in Nigerian adults with presumed TB.
Methods: We retrospectively analysed 178 urine samples from adults with presumed TB at district hospitals in Abuja, Nigeria. Reference standard used was culture and Xpert MTB/RIF. Sensitivity, specificity, and concordance with the reference standard were calculated for both FujiLAM versions, stratified by HIV status.
Results: FujiLAM (v.2) showed an overall sensitivity of 58.3% and specificity of 97.3%, while FujiLAM (v.1) yielded a sensitivity of 52.9% and specificity of 99.0%. These results indicated no significant difference in diagnostic accuracy, confirmed by McNemar's test (TB-positive samples: χ^2=0, p=1.0, 95% CI: 0.013–0.987; TB-negative samples: χ^2=0.333, p=0.56, 95% CI: 0.008–0.906).
For participants living with HIV, FujiLAM (v.1) detected TB in 5/7 and correctly classified 49/51 TB-negative samples. FujiLAM (v.2) detected 4/7 and 55/56, respectively. For those without HIV coinfection, FujiLAM (v.1) detected 9/17 and 96/97, and FujiLAM (v.2) detected 10/17 TB-positive and 94/97 TB-negative samples.
FujiLAM (v.2) showed improved test validity, with fewer invalid results (1 vs. 6). Concordance with the bac-

teriological reference standard remained high (92.1%, κ=0.623), and overall agreement was 97.1%, showing consistent results between both FujiLAM versions.
Conclusions: The second-generation FujiLAM assay showed diagnostic accuracy similar to FujiLAM (v.1). FujiLAM continues to be a promising, non-invasive tool for TB detection in people living with and without HIV. Further large-scale studies are recommended using multiple lots.

TBS-EP449 Novel mutations in genes associated with bedaquiline and linezolid resistance in drug- naiive *Mycobacterium tuberculosis* isolates

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Since Bedaquiline (BDQ) and Linezolid (LZD) have been introduced recently for treatment of multidrug resistant tuberculosis (MDR-TB), it is crucial to monitor emerging resistance patterns in regional *Mycobacterium tuberculosis* isolates.
Sputum samples were collected from 365 pulmonary tuberculosis patients including 103 new patients, 143 multidrug resistant TB (MDR-TB) patients not receiving BDQ/LZD, and 119 MDR-TB patients on BDQ and/or LZD therapy.
Minimum inhibitory concentrations (MICs) were determined using the microplate alamar blue assay (MABA). Samples were cultured on Löwenstein-Jensen (LJ) medium. A total of 89 *M. tuberculosis* strains were isolated: 41 from new smear-positive patients, 33 from MDR-TB patients, and 15 from patients on BDQ/LZD therapy.
All isolates were confirmed as *M. tuberculosis* using an in-house duplex PCR, and whole-genome sequencing was performed. Sequence data were analyzed using PhyResSE.
Novel insertions in the *Rv0678* gene were detected in three BDQ-exposed isolates with MICs >0.25 μg/ml. A canonical *Rv0678* mutation (Gly66Glu) associated with BDQ resistance was found in one isolate not previously exposed to BDQ but with a high MIC (1 μg/ml). Two new smear-positive isolates harbored *Rv0678* mutations (Ser-2Thr and Gly11Ser), although their BDQ MICs were not elevated. No non-synonymous mutations were found in *atpE* or *pepQ*. No isolate showed high MICs to LZD. No *rrl* mutations were detected. The canonical *rplC* mutation Cys154Arg was observed in one isolate exposed to LZD. The *rplC* mutation Thr102Ile was seen in one isolate not exposed to LZD; and Ile105Val in two isolates. A non-synonymous *rplD* mutation (Arg79His) was observed in one isolate not exposed to LZD.
This study highlights the emergence of novel mutations in BDQ and LZD resistance-associated genes, including in isolates without prior drug exposure, warranting further investigation. These findings underscore the importance of ongoing genomic surveillance to detect emerging resistance in *M. tuberculosis*.

TBS-EP452 Measuring cellular responses against respiratory pathogens can help to guide prophylaxis in immunocompromised patients

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The potential of some respiratory pathogens to cause future pandemics underscores the need for robust preparedness, particularly to protect immunocompromised individuals who are at high risk of severe outcomes. Monoclonal antibody (mAb) prophylaxis has been seen to be beneficial during the COVID-19 pandemic for patients most prone to worse outcomes, but was only recommended for those patients without a specific humoral response to vaccination. Evaluating cellular immunity could give a better overview of the immune status to guide prophylaxis decisions in respiratory infections than serology alone.
Blood was collected from 130 mAb immunocompromised prophylaxis candidates grouped by serology status against SARS-CoV-2: positive (≥260 BAU/mL, n=90) and negative (<260 BAU/mL, n=40). Peripheral blood mononuclear cells (PBMCs) were isolated and stimulated overnight with a SARS-CoV-2 Spike pool. Cellular responses (IFN-γ, IL-2, IL-21, and IL-5) were measured using a FluoroSpot (CoV-iSpot, GenID, Germany) and quantified with an automatic reader.
Participants with negative serology showed a lower frequency (40% vs 60%) and intensity of SARS-CoV-2-specific responses (p=0.059 for IFN-γ, p=0.004 for IL-2, p=0.032 for IL-21, and 0.069 for IL-5), as well as lower polyfunctionality (p=0.0124) compared to those with positive serology. The multiparametric analysis showed a lower probability of IFN-γ response in participants with negative serology, no previous COVID-19, and under corticoid treatment compared to positive serology, previous COVID-19, and no corticoid treatment (3-13% and 68-88%, respectively).

These findings demonstrate that, in immunosuppressed patients, the absence of a humoral response does not signify a lack of cellular response. However, negative serology patients exhibit weaker and less polyfunctional cellular responses. Clinical factors such as previous infection and corticoid use significantly impair cellular responses, increasing susceptibility to severe respiratory infection. Therefore, assessing specific cellular immunity can guide clinicians in prioritizing mAb prophylaxis against respiratory pathogens.

TBS-EP455 Radiological features of pulmonary nontuberculous mycobacterial disease depending on the species of the pathogen

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Background: More than 170 species of nontuberculous mycobacteria (NTM) have been described to date, with approximately 60 implicated in pulmonary disease. In addition to microbiological confirmation, radiological evaluation is a key tool for determining the need for therapy and monitoring disease progression.
Objective: To investigate radiological patterns of pulmonary NTM disease depending on the NTM species involved.
Materials and Methods: A retrospective analysis was conducted on 134 patients with confirmed pulmonary NTM disease from 50 regions of the Russian Federation, diagnosed at the National Medical Research Center for Phthisiopulmonology and Infectious Diseases in 2023–2025. Inclusion criteria: patients with NTM species identification by molecular-genetic or culture-based methods (sputum [×2], bronchoalveolar lavage, or surgical samples) using MALDI-TOF mass spectrometry, and available chest CT data prior to treatment initiation. Radiological features assessed included disease extent, cavitary lesions, bronchiectasis, and nodular dissemination.
Four NTM species were identified: *Mycobacterium avium* (n=77; 57.5%), *M. chimaera* (n=32; 23.9%), *M. kansasii* (n=17; 12.7%), and *M. abscessus* (n=8; 5.9%).
Results: Bilateral pulmonary involvement was common across all species: *M. avium* – 89.6%, *M. chimaera* – 96.9%, *M. abscessus* – 87.5%, and *M. kansasii* – 64.7% ($p>0.05$). Cavitary lesions were most frequently observed in *M. kansasii* cases (82.3%), while less frequent in *M. avium* (33.8%), *M. chimaera* (37.5%), and *M. abscessus* (25%) ($p<0.05$). Conversely, nodular dissemination was significantly less common in *M. kansasii* (41.1%) compared to other species: *M. avium* – 89.6%, *M. chimaera* – 84.4%, *M. abscessus* – 100% ($p<0.05$). Bronchiectasis was also less frequent in *M. kansasii* cases (23.6%) vs *M. avium* (62.3%), *M. chimaera* (68.8%), and *M. abscessus* (75%) ($p<0.05$).
Conclusion: Pulmonary NTM disease caused by *M. avium*, *M. chimaera*, and *M. abscessus* is typically characterized by bilateral nodular dissemination and bronchiectasis. In contrast, *M. kansasii* infection more frequently presents with cavitary lung disease and fewer bronchiectatic or disseminated changes.

TBS-EP458 Estimating the effect of implementing novel diagnostics in adults and children on pediatric TB indicators in KwaZulu-Natal, South Africa

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Few modeling studies have evaluated effects of implementing oral swabs, newer generation urine LAM testing or computer aided detection for chest X-rays (CAD-CXR) in both adults and children. More information is needed to understand the impact of a missed diagnosis in adults on ongoing household transmission to pediatric contacts. Using simulated TB transmission modeling, our objective is to estimate the effect of implementing novel diagnostics in both adults and children in a South African district municipality on pediatric TB incidence, mortality, TB Preventive Therapy (TPT) initiation.
We will use TBSim v0.40, an agent-based stochastic TB transmission model, to simulate TB transmission within a simulated population representing uMgungundlovu district in KwaZulu-Natal, South Africa. We will simulate district transmission between January 2016 and December 2055, using a bi-weekly time step. We will apply age specific probabilities for risk of transmission between disease states using literature values, accounting for HIV and BCG status. We will use a combination of household and random networks to model agent interactions. Agents initiate health-seeking behavior once entering an active disease state, and initiate the diagnostic cascade if screened positive. We will simulate 13 separate diagnostic scenarios with varying diagnostic performance (Figure 1).
If test positive, the agent is initiated on treatment, with treatment success probability based on reported district success rate. Household members are then screened,

tested, or initiated on TPT if eligible. We will use a base population of 1,111,872 agents, an initial TB prevalence of 852 cases per 100,000 population, 272,666 household units with average size 3.7 individuals, and age structure which reflects 2016 census data.

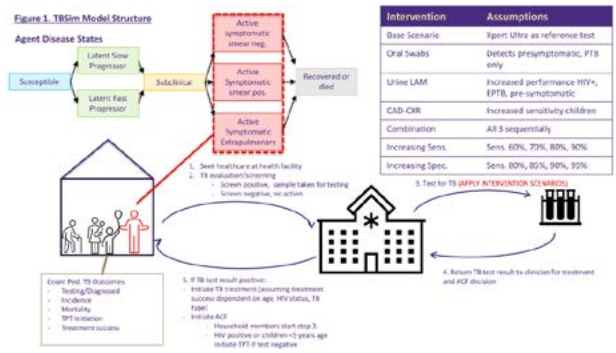

Figure 1.

For each simulated year, we will calculate pediatric TB incidence, TB related mortality, number of children tested/diagnosed, and number of children initiated on TPT. We will calibrate model estimates using annual district level pediatric incidence between 2016 and 2023.

TBS-EP461 The iron-vitamin D axis in tuberculosis: Hepcidin modulation as a target for precision host-directed therapy

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Objective: Iron deficiency anemia (IDA, ~53%) and vitamin D deficiency (VDD, >70%) commonly co-occur in tuberculosis (TB), worsening treatment outcomes and mortality. Inflammatory hepcidin elevation restricts iron from *Mycobacterium tuberculosis* (Mtb), yet induces anemia of inflammation (AI). Vitamin D transcriptionally suppresses hepcidin (HAMP), offering a dual-acting immunometabolic intervention point.
Methods: We conducted a structured analysis of 72 studies including:
• Preclinical models (β2m-KO mice, C3HeB/FeJ granulomas)
• 12 clinical RCTs (vitamin D and iron supplementation)
• Spatial transcriptomic datasets from granulomatous lesions
• AI-driven cytokine network meta-analysis
• Machine learning (clustering, regression) to model micronutrient thresholds predictive of TB outcomes.
Key Findings:
1. Vitamin D suppressed *hepcidin* expression (↓32%, p<0.01) and upregulated ferroportin, enhancing macrophage iron efflux (↑1.8-fold, *p*=0.003).
2. Combined lactoferrin + vitamin D reduced *Mtb* burden 1.5-log (p<0.001) in iron-overloaded macrophages.
3. ML identified serum 25D >50 nmol/L + hepcidin <13.2 nmol/L as predictive of reduced TB progression (aHR=0.38; 95% CI 0.22–0.66) in high-anemia cohorts.
4. VDR TaqI 'tt' genotype carriers showed accelerated sputum conversion with vitamin D (aHR=1.7; 95% CI 1.2–2.4).

Conclusions & Vision: Modulating the vitamin D-hepcidin-ferroportin axis concurrently restricts *Mtb* iron access and ameliorates AI. We propose:
• **Precision trials**: Genetically stratified vitamin D supplementation (VDR/DBP screening)
• **HDT development**: Clinical evaluation of lactoferrin + vitamin D analogs
• **Policy integration**: Adoption of 25D/hepcidin thresholds in high-anemia settings.

TBS-EP464 Research on patients with NTM lung disease accompanied by anxiety or depression and related risk factors

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Objective: To explore the relationship between nontuberculous mycobacterial (NTM) lung disease and anxiety and depression, as well as the related risk factors for NTM lung disease accompanied by anxiety and depression.
Methods: A total of 314 patients with NTM lung disease who visited Shanghai Pulmonary Hospital from October 2019 to October 2021 were designated as the study group, while 308 patients with pulmonary tuberculosis were designated as the control group. The Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) were used to assess the anxiety and depression symptoms of the patients. The prevalence rates of anxiety and depression, demographic characteristics, living environment, pet ownership, smoking, drinking, tuberculosis history, recurrent bronchiectasis history, physical complications, fever, cough, chest pain, and anemia were compared between the two groups.
Results: The prevalence of anxiety in patients with NTM lung disease was 21.3%, and the prevalence of depression was 29.6%. Multivariate logistic regression analysis revealed that autoimmune diseases (aOR, 7.48; 95% CI, 1.12-50.05) and chest pain (aOR, 2.35; 95% CI, 1.10-4.99) were risk factors for anxiety in patients with NTM lung disease. Being married (aOR, 4.84; 95% CI, 1.17-19.95), living in a dark and damp environment (aOR, 5.92; 95% CI, 1.62-31.65), chest pain (aOR, 2.29; 95% CI, 1.16-4.52),

and anemia (aOR, 2.31; 95% CI, 1.21-4.43) were risk factors for depression in patients with NTM lung disease. The AUC of the ROC curves were 0.755 and 0.702, respectively.

Conclusion: Patients with NTM lung disease are at a higher risk of developing anxiety or depression. There are differences in demographic and clinical characteristics between NTM lung disease and pulmonary tuberculosis patients. Autoimmune diseases and chest pain are related to anxiety in patients with NTM lung disease, while chest pain and anemia are related to depression in patients with NTM lung disease.

TBS-EP467 Reasons for refusal of TB preventive treatment uptake by eligible contacts of TB patients in high TB burden settings

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Background: One fourth of the global population is infected with tuberculosis (TB). UNHLM sets the target to provide TB preventive treatment (TPT) to 30 million infected people from 2023-27. Contrary to high commitment, only 3.2 percent of eligible household (HH) contacts started TPT in Pakistan during 2023(GTB Report 2024). Reaching TB contacts, is a programmatic challenge in resource limited and high TB burden countries. This situation gets worse when contacts refuse to take TPT despite of free services. This paper analyses the reasons for refusal of TPT uptake.

Methodology: A cross-sectional descriptive study was conducted involving HH contacts (who refused to take TPT) of bacteriologically confirmed TB patients diagnosed between November 2024 to February 2025 in Lahore, Rawalpindi and Peshawar. Among these, 429 individuals responded to surveyors. Data was collected through pre-tested structured questionnaire and analysed using SPSS version 26.

Results: Mean age of respondents was 39.83 years (SD 14.03), males 283 (66%) and females 146 (34%). Most of the respondents were parents (33%) followed by siblings (24%) and others. Reasons for refusal were, limited perception of susceptibility and severity among 186 (43%) contacts while barriers to health seeking included fear of TPT drugs & side-effects among 105 (24%), stigma among 74 (17%) and operational challenges among 64 (15%). The reasons of refusal were significantly associated with relation of respondent with TB patient (0.010) and the income status (0.017). Age was also significantly related with reasons of refusal; procedural reasons were more among older people and medicine fear were commoner among younger people. Lack of trust in TPT was significantly higher among uneducated (p=0.015) and people in low-income group (0.041).

Indicators	Sub-indicators	n	
	Total	429	
Sex	Male	283	66%
Age	Mean	39.83	SD±14.03
Education	No formal education	55	13%
Income (per month)	No income source	155	36%
Reasons for refusal	Lack of trust in the need for TPT	186	43%
	Fear of TPT drugs and their side effects	105	24%
	Stigma	74	17%
	Operational challenges	64	15%

Conclusion: Impercipient understanding of infected community about the TB infection and treatment requirement is the major barrier for TPT and may be addressed through advocacy and communication with relevant stakeholders.

TBS-EP470 Isolation of non-tuberculous mycobacteria (NTm) from household water of patients with NTM pulmonary disease

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Background: Evidence collected over the past few decades has confirmed that NTM is a normal resident of an area, including various environments including soil and water sources. There is some evidence that susceptible individuals maybe infected from drinking water in their own homes.Understanding the link between household water sources and NTM pulmonary disease is crucial for developing targeted interventions and reducing the burden of this increasingly prevalent disease.

Design/Methods: To examine the prevalence of mycobacteria in household water, 500 mL water samples and swabs were collected from all taps of 19 patients' homes. The amplification of mycobacterial 16SrRNA with bacteriological identification was as a protocol to discriminate mycobacterial isolations from non- mycobacterial isolations. The 570bp 16SrRNA amplicon was sequenced and used to define mycobacterial species.

Results: The mycobacteria isolated from clinical samples from 19 patients included M. intracellulare, M. avium, M. abscessus, and M. kansasii. NTM isolated from household water of patients included M. avium (1 case), M. abscessus (2 cases), M. kansasii (8 cases), M. gordonae (1 case), M. gilvum (1 case), M. fortuitum (1 case), M. porcinum (1 case). M. abscessus, M. kansasii, and M. avium caus-

ing human disease were isolated from household water. Though M. intracellulare was the predominant species isolated from patients with NTM pulmonary disease, it wasn't found in household water. In addition,
our results revealed that NTM preferentially colonize in biofilm/sediment (75% of positive growths were from tap swab samples), indicating the significance of finding specific NTM species in household water in relation to the patients'conditions, or the lack of correlation between M. intracellulare in patients and its absence in household water.
Conclusions: The isolation of pathogenic NTM species from household water underscores the critical role of water hygiene in preventing NTM pulmonary disease and highlights the need for targeted public health strategies.

TBS-EP476 Substantial derangement in transcriptomic pathways seen in children with tuberculous meningitis and hydrocephalus

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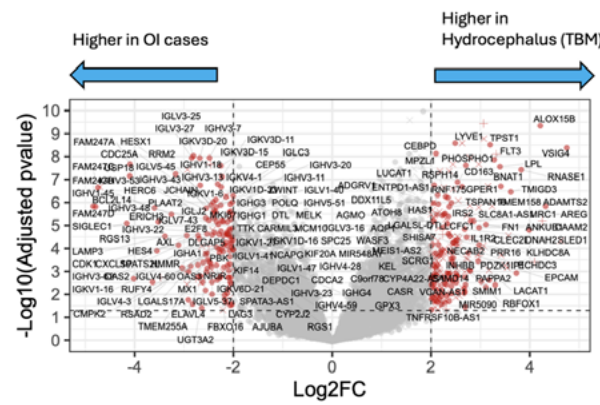
Background: Tuberculosis Meningitis (TBM) is the most severe form of tuberculosis (TB) disease. Even with early diagnosis and treatment the fatality rate in children is 20%, with 50% of survivors left with permanent neurological disabilities. Prognosis is worsened by complications from infarctions and hydrocephalus. Limited knowledge about the pathogenesis mechanisms of TBM infarction and hydrocephalus in children has hampered the identification of new therapeutics resulting in this high mortality rate.
Methods: Gene expression (RNA-seq, whole blood) data were analysed from a retrospective cohort of 27 children recruited from South Africa, 18 children with TBM, and 9 symptomatic controls. The gene expression was compared between these two groups as well as the subgroups of children with TBM with and without hydrocephalus and infarctions.
Results: Preliminary results showed 2367 differentially expressed genes (DEGs) between children with TBM and symptomatic controls. 4568 DEGs were found when comparing just the hydrocephalus subgroup to symptomatic controls (Figure 1).
Subsequent GO biological process analysis of both these genes sets revealed them to be largely related to B-cell mediated immunity and complement activation. When comparing the hydrocephalus subgroup to the non-hydrocephalus group, 79 DEGs involved in neutrophil activation and degranulation were found. No DEGs were found when comparing the infarction and non-infarction subgroups.

Figure 1: Volcano plot demonstrating differentially expressed genes between children with tuberculous meningitis and hydrocephalus and symptomatic controls



Discussion: Children with TBM and hydrocephalus appear to have substantial differences in the underlying biological pathways compared to symptomatic controls. This could have implications for understanding of the biological mechanisms responsible for TBM complications that worsen prognosis in children.

TBS-EP479 Adherence to isoniazid preventive therapy and its associated factors among HIV patients receiving treatment in five districts in Ghana

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Background: Isoniazid Preventive Therapy (IPT) is an essential intervention for reducing the risk of tuberculosis (TB) infection among individuals living with HIV. Despite its proven benefits, adherence rates remain suboptimal in many settings. We assessed adherence to isoniazid preventive therapy and identified its associated factors among HIV patients receiving treatment in five districts in Ghana.

Methods: We used ART clinic records to randomly select HIV-positive adults who have been on IPT for at least one month for inclusion in the study. The contact information of the selected participants was used to trace them to their homes for interviews, while those who were due for ART visits at the time of the study were interviewed at the health facilities. Descriptive statistics provided summaries of adherence rates, while logistic regression helped identify associated factors of IPT adherence. STATA 17 software was used for the analysis.
Results: In the 1,265 HIV-positive adults studied, the mean age was 45 years (±22.5), with females being in the majority, 784 (62%). Seven hundred (66.1%) adhered to their IPT regimen, 956 (74.8%) correctly identified IPT's role in preventing TB in HIV patients, and 62.9% had a good level of knowledge of IPT. Barriers to adherence included side effects (389; 30.8%), difficulty in taking IPT alongside ART (358; 28.3%), long clinic waiting times (204; 16.1%), medication stockouts (262; 20.7%), and transport costs (305; 24.1%).
Being older than 50 years [AOR=0.58 (CI: 0.4–0.9), p=0.007], having had basic education [AOR=0.45 (CI: 0.3–0.7), p<0.001], being self-employed [AOR=0.74 (CI: 0.6–1.00), p=0.049], and level of IPT knowledge [AOR=2.17 (CI: 1.6–2.9), p<0.001] were significantly associated with IPT adherence.
Conclusion: IPT adherence was suboptimal when compared to the national target of 90%. Addressing medication stockouts and enhancing patient education could improve adherence.

TBS-EP482 Prospective prediction of TBAJ-876-PaL phase 2 clinical outcomes in NC-009 trial via a multi-model framework

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Successful preclinical-to-clinical translation can accelerate development of safer, more effective tuberculosis regimens. Here, we leveraged a multimodal model-based framework to prospectively predict clinical outcomes of the promising diarylquinoline TBAJ-876, in combination with pretomanid and linezolid (TBAJ-876-PaL), in Phase 2 NC-009 trial (NCT06058299), ahead of trial read-outs. Analyses followed a pre-specified plan (v1.0, 2025-03-11), locked prior to availability of trial results.
We integrated translational tools incorporating TBAJ-876 preclinical and Phase 1 data with real-world patient phenotype evidence from clinical data on bedaquiline (B)-Pa-backbone regimens used as a proxy for TBAJ-876-PaL.
First, we quantified mouse exposure-response relationship by modeling individual contributions of TBAJ-876 and its active metabolite, TBAJ-876-M3, to bacterial colony-forming unit (CFU) decline.
Second, to align bacterial burden measures between preclinical and clinical settings, we utilized time-to-positivity (TTP)-CFU paired data across eight trials to convert baseline TTP from NC-009 to CFU for simulations.
Third, we predicted clinical responses to 25, 50, and 100 mg of TBAJ-876 with PaL by using mouse exposure-response, informed by clinical pharmacokinetic model, species-specific protein binding adjustments, and trial design.
Finally, to consider clinical features not reflected in translational models, we applied one-week delay for participants with bilateral cavitation and/or older age, based on phenotype-specific culture conversion profiles from previous trials. BPaL clinical outcomes were predicted similarly.
Predictions indicated clear dose-response for TBAJ-876-PaL, measured by time to stable culture conversion through 2 months, with a slow onset of dose-dependent separation becoming apparent only in the second month of treatment. TBAJ-876 at 100 mg with PaL was predicted to outperform BPaL.
Our framework integrated available data and knowledge to enhance reliability of clinical translation and enabled prospective prediction of TBAJ-876-PaL outcomes in NC-009 trial. Once validated, this approach will offer a leading model to inform dose selection and treatment optimization before trials, advancing development of novel tuberculosis regimens.

TBS-EP485 Implementation of TPT with shorter regimens: Experience from Bangladesh

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Bangladesh is one among the 30 high TB burden countries. The National TB Control Programme in Bangladesh has achieved a TB treatment coverage and treatment success rate at 82% and 95% respectively.
However, TB chemo-prevention had lagged behind with low coverage and low treatment completion rates among TPT eligible people. NTP Bangladesh set out to scale up

TPT implementation across the country to redress this programmatic constraint. Eros scaled up in 64 districts in 2022 covering throughout the country. From 2021 we initiated efforts to scale up TPT among eligible persons across the country. Using ACF and TB -IPC as entry points for TPT. We targeted House hold contacts of Pulmonary bacteriologically Confirm TB cases of all age group including children under five, PLHIV, people living with diabetes and other TB vulnerable populations for TB screening.

To enhance coverage of TB screening for the identified TB at risk populations NTP developed and implemented interventions for community engagement and behavior change and communication. People screening negative for TB were offered TPT using WHO recommended shorter regimens and supported to complete treatment.

The table below shows the results of the interventions that the National TB Control program Bangladesh implemented to scale up TPT.

Year	TPT NSP Eligible	PF target- N (% of NSP eligible)	Achievement -N (% of PF target)
2022	703931	133855 (19.01%)	153938 (115%)
2023	729553	149152 (20.44%)	165625 (111%)
2024	749208	168011 (22.42%)	177972 (105%)

We achieved a TT completion rate more than 96.00%. TPT was generally safe with no grade 3/4 adverse events observed.

Conclusion: While TPT implementation among healthy individual is very challenging, concerted efforts with multiple supportive interventions can lead to a successful implementation of this programmatic tool. This intervention can support efforts to decrease TB incidence in Bangladesh.

TBS-EP488 Empowering National TB Control Program through artificial intelligence-enhanced portable X-ray deployment in Bangladesh

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Background: Tuberculosis remains a leading public health concern in Bangladesh. Despite national efforts, early detection and comprehensive screening remain challenging, especially in remote and underserved areas. In response, NTP of Bangladesh, in collaboration with SR and Delft Imaging, has been leveraging AI-enabled portable X-ray technologies to scale up and decentralize TB screening.

Objective: This initiative aims to evaluate the implementation and operational outcomes of AI-powered portable X-ray units across 26 strategically selected districts, improving TB case finding through technological innovation.

Methods: Since January 2023, portable X-ray units integrated with AI-based diagnostic support tools (e.g.,Delft Light, Delft CAD4TB, Qure.ai software) have been deployed in high-risk and hard-to-reach areas, including eight districts in Rajshahi and Rangpur, 3 hill tracts of Chattogram, and selected urban and rural districts across Sylhet, Barishal, Narsingdi, and Dhaka. Both Delft and Fuji X-ray machines have been equipped with AI software licenses. AI algorithms automatically analyze chest radiographs to detect TB-like abnormalities, supporting frontline health workers in triaging presumptive TB cases.

Results: From Jan-Dec 2024, the system has facilitated extensive community-level screening, contributing to a rising quarterly trend in TB detection. This digital innovation ensures efficient diagnosis where skilled radiologists are not available. Challenges such as equipment failure, lack of technologists, and energy constraints were mitigated through rapid maintenance, solar backup systems, and logistics support. As of now, 24 AI-equipped X-ray units are in active operation, strategic MoU between NTP with SR has been extended through 2026 to scale up these efforts.

Conclusion: Integration of Artificial Intelligence into TB screening workflows via portable X-rays marks transformative step in achieving early detection at scale. This model of decentralized, technology-driven case finding demonstrates significant promise in high TB burden settings. It underscores the potential of AI not just as a diagnostic aid but as a catalyst for broader health system innovation.

TBS-EP494 Ten years of tuberculosis treatment outcomes in North Africa: A systematic review and meta-analysis

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Background: Tuberculosis (TB) continues to pose a significant public health challenge across North Africa, with treatment outcomes varying widely between countries. Despite global progress in TB control, the region experiences persistent difficulties including inconsistent cure rates, suboptimal treatment adherence, and increasing rates of drug-resistant TB. These issues are further compounded by political instability and limited healthcare resources in some areas.

This study aims to systematically review and analyze TB treatment outcomes across North African countries including Libya, Tunisia, Algeria, Morocco, Egypt, and Sudan, identify regional disparities and factors influencing treatment success. Outcomes of interest include cure rates, treatment completion, failure, default, and mortality.

Methods: This systematic review is being conducted following PRISMA guidelines. Studies are being identified through comprehensive searches of PubMed, Scopus, and Web of Science, targeting publications from January 2015 to May 2025. Eligible studies report treatment outcomes for TB patients in the specified countries. Data extraction and quality assessment are currently underway.

A meta-analysis using a random-effects model will be performed to estimate pooled treatment outcomes, and subgroup analyses will explore differences by country, TB type (e.g., drug-sensitive vs. drug-resistant), and exposure to conflict or instability.

Preliminary Observations: Early screening suggests significant disparities in TB treatment success across the region. Drug-resistant TB cases and populations in conflict-affected areas appear to face worse outcomes, indicating structural barriers to effective care and follow-up.

Conclusions: This ongoing research will provide a comprehensive overview of TB treatment outcomes across North Africa and identify key gaps in current national programs. Findings are expected to support evidence-based policymaking and inform regional strategies for improving TB control. Final results and recommendations will be presented at the conference in November 2025.

Keywords: Tuberculosis, North Africa, Treatment outcomes, Systematic review, Meta-analysis, Drug resistance

TBS-EP497 Impact of alternative latent-infection progression rates on modelled tuberculosis transmission

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Background Uncertainty in the speed with which people with latent Mycobacterium tuberculosis infection progress to active disease is a major driver of variance in global burden projections.

Methods We developed an integrated transmission framework linking natural-history, drug-resistance, diagnostic and post-TB disease sub-models. The slow-progression rate (γ_s= 0.000594 per year) was fixed, while two published fast-progression (γ_f) hypotheses were compared: 0.0826 per year (Scenario A) and 0.955 per year (Scenario B). Model was calibrated to total TB incidence, deaths and rifampicin-resistant TB (RR-TB) incidence of China published by WHO.

Results Scenario A reproduced historical trends (R^2= 0.95 for total TB incidence, 0.99 for incident RR-TB incidence, 0.82 for TB deaths). Scenario B fitted less well for total TB incidence (0.58) and deaths (0.58) but comparably for RR-TB incidence (0.96).

The posterior mean force of infection (λ) in 2023 was 2.35 per year (95 % credible interval [CrI] 1.16~3.58) under Scenario A versus 6.03 per year (95 % CrI 3.89~16.98) under Scenario B.

Conclusion Even apparently well-fitting TB models can diverge markedly when latent-to-active progression is weakly constrained. Generating empirical data on latent infection progression rates should therefore be prioritized to strengthen the evidence base supporting the End TB Strategy.

TBS-EP500 Eco-climate and socioeconomic determinants of non-tuberculous mycobacterial pulmonary diseases among notified TB cases in China: Observational and modelling study

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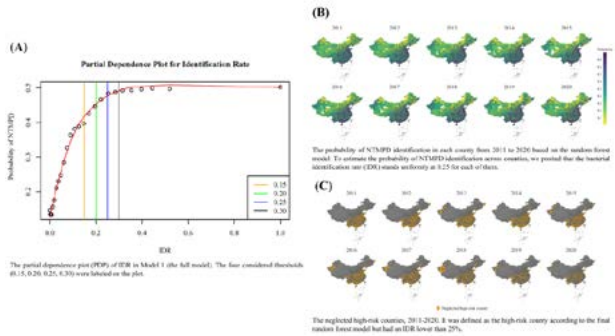
Objectives: To determine the prevalence of non-tuberculous mycobacterial pulmonary disease (NTMPD) in patients presumed to have pulmonary tuberculosis in China, and to assess the influence of ecological, climatic, and socioeconomic factors on the identification of NTMPD using random forest models.
Design: Observational study and modelling analysis.
Methods: The spatiotemporal distribution of NTMPD among registered TB cases in China from 2011 to 2020 was analyzed. Joinpoint regression models were used to explore temporal trends in NTMPD prevalence and their spatial heterogeneity. A random forest model was applied to assess the effects of ecological, climatic, and socioeconomic factors on NTMPD identification.
Data sources: National TB Information Management System (TBIMS).
Results: NTMPD cases were concentrated in the eastern and southeastern coastal areas of China. An overall decline in the NTMPD prevalence was observed (AAPC = -1.64%, 95% CI: -2.76% to -0.51%), though with notable spatial heterogeneity. The random forest analysis identified annual average temperature, GDP, and water coverage area as key predictors of NTMPD identification. A total of 573 counties still remained classified within the neglected high-risk category in 2020.



Conclusion: Despite the overall decrease in NTMPD identification in China, spatial heterogeneity and under-identification in high-risk counties highlight the need for improved bacterial identification and targeted public health interventions.

TBS-EP503 Trends in tuberculosis detection using GeneXpert in a rural Ghanaian district: A six-year retrospective analysis (2019–2024)

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Background: The GeneXpert MTB/RIF assay has improved tuberculosis (TB) diagnosis globally, but only few rural settings in West Africa have published data on long-term diagnostic trends. This study presents a six-year retrospective analysis of TB testing using GeneXpert in Biakoye District, Ghana, assessing test volume, MTB positivity rates, and rifampicin resistance detection from 2019 to 2024.
Methods: We conducted a retrospective review of GeneXpert test records from the Biakoye District TB program for the period January 2019 to April 2024. Data extracted included the number of tests conducted, MTB-positive results, and rifampicin resistance status. Smear microscopy data were unavailable. Descriptive analysis was used to assess trends over time.
Results: A total of 3,243 GeneXpert tests were conducted during the review period. Annual test volume ranged from 35 in 2020 (likely reflecting COVID-19 disruptions) to 1,220 in 2024, indicating improved programmatic scale-up. MTB positivity rates varied by year: 13.0% (2019), 100% (2020, n=35), 8.5% (2021), 13.6% (2022), 19.1% (2023), and 5.8% (2024), with an average positivity rate of 13.3%. Across all six years, no rifampicin resistance was detected. The highest number of confirmed TB cases (n=98) occurred in 2023.
Conclusion: We found increasing diagnostic coverage and fluctuating positivity rates for TB in a rural Ghanaian district using GeneXpert. The absence of rifampicin resistance detection over the study period may reflect low prevalence or limited detection capacity. The steep rise in 2024 testing volume highlights improved surveillance capacity.
Further studies to explore demographic patterns and confirm rifampicin susceptibility through complementary methods are recommended. Strengthening laboratory capacity and ensuring continuous GeneXpert access will be key to sustaining diagnostic gains in similar settings.
Keywords: Tuberculosis, GeneXpert, rifampicin resistance, rural Ghana, diagnostic trends, molecular diagnostics, TB surveillance

TBS-EP506 Fate of TB treatment among the patients who remained bacteriologically positive after two months of anti-TB drugs

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Tuberculosis is the leading cause of mortality worldwide. Pakistan is the 5th high burden country with 686,000 annual incident cases. Although the treatment success rate of Pakistan is higher than global average, still 21,904 TB patients could not complete the treatment successfully during 2023. This paper evaluated the factors associated with unsuccessful treatment outcome of TB disease with special focus on those who remained sputum smear microscopy (SSM) positive after 2 months of treatment.

Methodology: This retrospective cross-sectional study evaluated the data of TB patients who started treatment at public private mix settings of 28 districts of Pakistan from July 2021 till March 2024.

The study included data of patients who had pulmonary TB, TB bacilli was confirmed on SSM or Gene Xpert, had valid results of 2 months follow-up (FU) SSM and the treatment outcome was declared. The study excluded patients whose information was missing, outcome was not declared or there was change in regimen.

Results: During the study period 11,228 patients started TB treatment with mean age 39.09 (SD± 18.66), and male to female ratio was 53:47. First FU SSM was positive among 319 patients (2.8%).

FU positivity was significantly higher among; male (3.2%) (P=0.012), treated after loss to FU (11.1%) and failure (6.3%) ($p < 0.001$), higher bacterial load at the beginning of treatment ($p < 0.001$) and with increase in age (p=0.020). FU SSM positivity was significantly associated with unsuccessful treatment outcome, i.e 9.7% vs 1.6% among FU SSM positive and negative patients ($p < 0.001$). Failure rate was 6.3% and 0.4% and death rate was 2.5% and 0.7% among the FU SSM positive and negative respectively ($p < 0.001$).

Indicators	Sub-indicators	Follow-up Positive n (%)	Follow-up Negative n (%)	P Value
Total Patients		319(2.8%)	10909(97.2%)	
Sex	Female	129(2.4%)	5193(97.6%)	0.012
History of Treatment	New	283(2.8%)	9848(97.2%)	<0.001
	Treatment after failure	2(6.3%)	30(93.8%)	
	Treatment after loss to follow-up	9(11.1%)	72(88.9%)	
Grading of SSM	Scanty	11(1.8%)	596(98.2%)	<0.001
	1+	76(2.2%)	3426(97.8%)	
	2+	63(2.9%)	2139(97.1%)	
	3+	141(5.7%)	2318(94.3%)	

Conclusion: Follow-up positivity is associated with social and clinical determinants and a strong predictor of treatment outcome and must be accounted for during treatment.

TBS-EP509 Physiotherapy management in tuberculosis patients with co-existing HIV infection: Challenges in immunocompromised care

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Background: The co-infection of tuberculosis (TB) and human immunodeficiency virus (HIV) presents a significant public health challenge, particularly low-resource settings where the burden of both diseases is high. Patients with TB-HIV co-infection experience physical impairments, including respiratory distress, debilitating fatigue, various musculoskeletal complications. Despite the critical role of physiotherapy in alleviating these conditions, its implementation in the care of immunocompromised patients remains inadequately explored.

This study aimed to examine the challenges and strategies in physiotherapy management of TB-HIV co-infected patients and to evaluate the effectiveness of current rehabilitation practices

Methods: A mixed-methods cross-sectional design was utilized, incorporating structured questionnaires administered to a sample of 25 TB-HIV co-infected patients and in-depth interviews conducted with 12 physiotherapists from selected healthcare facilities. Quantitively data was analyzed using descriptive statistics to identity prevalent symptoms and interventions, while qualitative responses were subjected to thematic analysis to uncover underlying challenges and strategies in physiotherapy practice.

Results: The findings revealed that a significant majority of patients reported experiencing fatigue (88%), shortness of breath (76%), and muscle weakness (64%). Physiotherapy interventions employed included pulmonary rehabilitation (68%) and strength training (56%).

However, physiotherapists identified several key challenges in their practice, including limited access to resources, difficulties in infection control, insufficient training in managing co-infected patients, and patient non- adherence attributed to fatigued and psychosocial distress.

Conclusion: Physiotherapy emerges as a crucial yet underutilized component of comprehensive care for TB-HIV co-infected patients. To enhance the effectiveness of physiotherapy interventions, it is essential to address barriers such as resource limitations, training gaps, and psychosocial challenges faced by patients. This can be achieved through the implementation of integrated, pa-

tient-centered approaches and robust policy-level support improving the overall management of immunocompromised individuals.

TBS-EP512 Can simple blood tests predict heart disease in patients with pulmonary tuberculosis? - The TB-HEART Study

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Background: Recent data suggest pulmonary tuberculosis (PTB) is associated with increased CVD morbidity, but mechanisms are poorly understood. In the TB-HEART study, we aimed to determine the burden of cardiac pathology in patients with PTB and explore the predictive value of cardiac and inflammatory biomarkers.
Methods: In a cross-sectional study design, we consecutively recruited outpatients with bacteriologically proven PTB in Lusaka, Zambia. All patients underwent detailed cardiovascular assessment including two-dimensional echocardiography, and blood draws to quantify myocardial injury (high-sensitivity troponin I [hs-cTnI]), myocardial remodelling (N-terminal pro-B-type natriuretic peptide [NT-pro-BNP]), and inflammation (C-reactive protein [CRP]).
The primary outcome was echocardiographic evidence of any cardiac pathology (pericardial effusion, at least mild left ventricular systolic dysfunction (LVSD) and/or evidence of constrictive physiology). We then quantified the distribution of hs-cTnI, NT-pro-BNP, and CRP and their association with prevalent cardiac pathology.
Results: Between November 1st 2023 and October 15th 2024, we recruited 252 participants with pulmonary TB [mean age 35.4 ± 11.1 years; 75.4% (n=190) = male; 28.9% (n=73) living with HIV (LWHIV)], of whom 240 completed echocardiography. Of these, 100/240 (41.7%) had evidence of cardiac pathology.
There was a statistically significant association between cardiac pathology and CRP [OR 1.63 (1.24-2.13) p<0.001 for each log-normal increase in value] and NT-pro-BNP [OR 1.53 (1.23-1.92) p<0.001 for each log-normal increase in value]. Mean hs-cTnI was not associated with cardiac pathology, nor were sex, BMI or HIV status. After adjusting for age and sex, CRP [OR 1.44 (1.08-1.92, p=0.01 for each log-normal increase in value] and NT-pro-BNP [OR 1.40 (1.09-1.80) p=0.007 for each log-normal increase in value] remained strongly associated with cardiac pathology.
Conclusions: Cardiac pathology was present in almost half our participants and was strongly associated with biomarkers of inflammation and myocardial remodelling. This may indicate a novel pathophysiological mechanism of disease linking TB and CVD.

	All participants n = 240	Participants without cardiac pathology 58.3%, n = 140	Participants with cardiac pathology 41.7%, n = 100	ORs (95% CI) for the association with cardiac pathology	p value*
Living with HIV, % (n)	29.6% (71)	28.6% (40)	31% (31)	0.84 (0.49-1.91)	0.93
BMI >18.5 kg/m²	52.1% (125)	55.7% (78)	47% (47)	1	
BMI <18.5 kg/m²	47.9% (115)	44.3% (62)	53% (53)	1.01 (0.57-1.81)	0.95
CRP, in g/dl (mean ±SD)	83 (±SD 68.3)	70.8 (±SD 61.1)	101 (±74.1)		
Lognormal distribution, in g/dl	3.96 (±1.12)	3.76 (±1.18)	4.29 (±0.92)	1.44** (1.08-1.92)	0.01
NT-pro-BNP, in pg/ml (mean ±SD)	276 (±SD 701)	183 (±SD 469.6)	407 (±SD 921)		
Lognormal distribution, in pg/ml	4.63 (± 1.30)	4.36 (±1.18)	5.02 (± 1.34)	1.40** (1.09-10.80)	0.007
hs-cTnI, in ng/ml (mean ±SD)	5.09 (±SD 0.83)	5.07 (±SD 0.57)	5.12 (± 1.1)		
Lognormal distribution, in ng/ml	1.62 (0.09)	1.62 (0.07)	1.62 (0.11)	1.34 (0.06-26.79)	0.85

*Table 1 - Age-and sex-adjusted odds ratios for the estimated associations between any cardiac pathology (presence of pericardial effusion, at least mild left ventricular systolic dysfunction, and/or constrictive physiology) and relevant indicators among 240/252 participants who underwent echocardiography. For CRP, the model contains 238 individuals with available blood test results, and for NT-pro-BNP and hs-cTnI, this is 240 individuals. **Log-transformed values for CRP, NT-pro-BNP and Troponin were used - the associated odds ratio are for each doubling of the biomarker value. Legend: *p values were derived from the Wald test.*

TBS-EP515 Threat beyond TB: Rising menace of NTM infections and the urgent need for accurate diagnosis

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Background: Incidence of non-tuberculous mycobacterial (NTM) infections is on rise globally and poses significant diagnostic and treatment challenges for tuberculosis. Most of them are resistant to anti-tubercular drugs and due to overlapping clinical manifestations with *M. tuberculosis*, NTM infections are often misdiagnosed as drug-resistant TB. NTM susceptibility to drugs varies from species to species and there is no specific regimen for treatment. In India, the true prevalence of NTM infections is unclear, with reported rates ranging from 2% to 10%. Therefore, accurate and rapid diagnosis of NTM is essential for appropriate antimicrobial therapy.
Methods: The study researchers in our lab have been investigating the incidence of the disease, standardizing various molecular methods for the identification of NTM isolates, and standardizing the drug susceptibility assay for clinical isolates.
Results: This five-year study (2019–2024) analysed 828 clinical samples for non-tuberculous mycobacteria (NTM) infections, finding an 8.1% incidence r. The majority of NTM cases were detected in males (65.7%) and adults aged 21–50. Higher positivity rates are found in pulmonary samples in comparison to extrapulmonary samples. The most frequently isolated species was *Mycobacterium intracellulare*, followed by *M. abscessus* and *M. fortuitum*. The present study confirmed regional variation in NTM species distribution, with higher cases found in coastal districts of Odisha, India.
Drug susceptibility testing (DST) showed species-specific resistance . *M. intracellulare* and *M. scrofulaceum* are found to be susceptible to amikacin and clarithromycin, while *M. fortuitum* and *M. abscessus* are resistant to the majority drugs.
Conclusion: The findings emphasize the need for species-level identification and precise antimicrobial treatment . Taking way forward the researchers are now comparing different molecular methods such as line probe assay, PRA hsp65 assay and next generation sequencing methods, to identify NTM species to find the most cost-effective method in resource constraint settings.

TBS-EP518 Genomic insights into *Mycobacterium tuberculosis* lineages and antimicrobial resistance profiles in three Canadian provinces

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Tuberculosis (TB), caused by *Mycobacterium tuberculosis* (*Mtb*), remains a leading global health threat. Distinguishing reinfection from novel infection in recurrent TB is crucial for effective control, requiring high-resolution data. We employed Whole Genome Sequencing (WGS) on 153 *Mtb* sputum isolates from TB patients in Alberta, Saskatchewan, and Ontario, Canada.
Our analysis characterized genomic diversity, antimicrobial resistance (AMR) profiles, lineage identification, resistance mutation detection, and SNP-based analysis to infer evolutionary links. We observed diverse *Mtb* lineages, with Lineage 4 (Euro-American) predominating (n=74), followed by Lineage 3 (n=34), Lineage 2 (n=28), and Lineage 1 (n=15). The s-type was the most prevalent genotype within Lineage 4. One pair was classified as *M. orygis*. AMR was detected in 60 isolates, with high prevalence of isoniazid resistance (n=22), primarily associated with *katG* S315T and *fabG1* promoter mutations. Resistance-conferring mutations were also identified for streptomycin (n=20), rifampicin (n=9), ethambutol (n=5), ethionamide (n=2), and pyrazinamide (n=2). Eight isolates demonstrated co-resistance to both rifampicin and isoniazid.
When evaluating the relationship between lineage and resistance, most resistant isolates were associated with Lineage 1 (n=12), showing resistance to 24 drugs. This was followed by Lineage 2 (n=8), which exhibited resistance to 18 drugs; Lineage 4 (n=7), resistant to 14 drugs; and Lineage 3 (n=2), resistant to 4 drugs. The wet lab verified resistance in 29 isolates. Of the 29 cases, 16 were males over 24 years old, and 13 were females over 28. All occurred in individuals born abroad. This dataset shows that TB transmission is shaped by lineage distribution, drug resistance, and demographics.
In the future, SNP data and clinical records will be integrated to differentiate relapse from reinfection. The prevalence of Lineage 4 and multidrug-resistant strains highlights ongoing TB control challenges, emphasizing the vital role of WGS in real-time surveillance and public health strategies.

TBS-EP521 Transcriptomic profiles from animal hosts following infection with Mycobacterium bovis: A systematic review

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Introduction: Animal tuberculosis (aTB), caused primarily by *Mycobacterium bovis* (*M. bovis*), is a chronic zoonotic disease that affects a wide range of domestic and wild species. Understanding host–pathogen interactions at the molecular level is essential for developing improved control measures and diagnostic tools.

To better understand host responses to *M. bovis* infection, we conducted a systematic review of transcriptomic studies in infected animals.

Methods: This review followed the PRISMA guidelines. We searched PubMed, Web of Science, and BIOSIS databases for studies published between January 2007 and March 2024. Eligible studies involved natural or experimental *M. bovis* infection in any host species, followed by transcriptomic profiling using RNA-seq, microarray, or qRT-PCR. Reviews, meta-analyses, case reports, vaccine efficacy studies, and studies using BCG-only infection were excluded.

Results: The search identified 704 records; 263 remained after duplicate removal and 45 for eligibility. After screening and full-text evaluation, 22 studies met inclusion criteria. Early-stage infections (<48 hours post-infection) revealed upregulation of pathways associated with innate immunity, inflammation, endocytosis, and cell signaling (Table 1).

At mid-stage (~2 weeks post-infection), both pro- and anti-inflammatory cytokine responses were observed alongside adaptive immune activation. Late-stage responses (>4 weeks post-infection) predominantly involved adaptive immunity and tissue pathology.

Across studies, differentially expressed genes were largely driven by intracellular bacterial activity. However, no single gene was consistently expressed under comparable conditions across all studies.

Conclusion: Host transcriptomic responses to *M. bovis* infection vary across infection stages and study conditions.

However, metallopeptidase activity and anti-apoptotic gene expression emerged as recurring features and may represent potential biomarkers of *M. bovis* infection. Further research is needed to validate these targets.

Pathway	Differentially Expressed Genes
Innate Immunity & Inflammation	Upregulated: IL-18, IL-7, CSF3, CCL20, CSF2, NOS2, IL-1β, IL-23A, IL-6, CCL4, CXCL2, TNF-α, CCL8, CXCL11, IFN-γ, NFκB, IL-8, IL-12, FASLG, BCL2, IL-10, DDX58, OAS2, CASP8, CASP7, CXCL10, OAS1, PTX3, IL-17A, CCL5, IL-15, CCL1, CASP10
	Downregulated: CCL4, IL-8, IL-12, IL-6, FASLG, BCL2, IFN-γ, TNF-α, DFFA, AIFM1, CXCL6, IL-2, CSF2, IL-10, CCL3, PPBP, SPP1
Endocytosis and Trafficking	Upregulated: ANKRD17, ANTXR2, EHD4, KIF3A, EHD1, CLEC4E, LAMP3, MAPT, ATG5
	Downregulated: MAPT, AP1, SLC1A3, RAB42, SLC40A1, SLC546A3, SLC2A5, IGF2R, AP3B1, AP4M1, GGA1, ATPV0D2, ATP6V0A1, TAP2, SORT1, AP1B1
Cell Signaling	Upregulated: STAT1, C3AR1, CD244, GPNMB, EDN1, TLR2, TLR3, TRAF6, TRAF3, TICAM1, TICAM2, TAB2, TLR4, CD14, CXCR4, CCR5, CCR3, STAT2, TLR5, TLR10, CD40, ADRB3, CD80
	Downregulated: EDN1, ADORA3, S1PR1, VSTM2L, MYD88, PIK3IP1, GABBR2, TLR9, CCR3, TLR8, CCR1, CD14, CD38, CD55, CD36, FZD4, PTAFR, THBD, CCR1, PECAM1

Table 1: Major differentially expressed genes with known functions less than 48 hours post infection.

TBS-EP524 Assessment of awareness and knowledge of butchers on bovine tuberculosis in the Volta region of Ghana

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Background: Bovine tuberculosis (bTB) is a chronic infectious disease caused by Mycobacterium bovis, responsible for 143,000 new human cases and 12,300 deaths globally. Bovine tuberculosis poses significant risks to human health through the consumption of contaminated meat. Butchers, being in direct contact with animal carcasses, are at high risk of exposure.

This study aimed to assess the Awareness and knowledge of butchers in the Volta Region, Ghana, to identify gaps and challenges in disease management.

Methods: A cross-sectional study was conducted among 127 butchers in the seven districts in the Volta Region. Data were collected through interviews focusing on their awareness of bTB, knowledge of bTB, educational background, age, marital status, years of experience, and place of residence. The relationship between Knowledge of butchers and demographic characteristics was determined at a 5% significance level ($P < 0.05$)

Results: Out of 127 butchers interviewed, 71.6% had heard of bTB, mostly through work experience (96.7%), while only a minority cited formal education or media as sources of information.

Knowledge assessment revealed that 73.6% of butchers demonstrated good knowledge of bTB. Statistical analysis revealed that the district of residence was the main predictor of knowledge, with lower knowledge levels observed in Hohoe (33.3%) and Ketu South (50%), compared to Ho Municipal.

Other factors, such as educational level, years of experience, and marital status, were not significantly associated with knowledge in multivariate analysis.
Conclusion: The findings highlight overall awareness and knowledge of bTB among butchers are encouraging, however, reliance on informal workplace-based learning may limit the depth and accuracy of information, and also significant geographic disparities among butchers on knowledge of bTB is a major concern. Targeted education and training interventions are recommended to address these gaps and enhance bTB prevention and control in the meat industry.

TBS-EP527 Effectiveness of BPaL/BPaLM in central area of Taiwan

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Background: All-oral treatment regimens that are more effective, shorter in duration, and have a more tolerable side effects, the six-month regimens all-oral BPaL (bedaquiline, pretomanid, and linezolid) and BPaLM (BPaL, and moxifloxacin), were recommended by the World Health Organization (WHO) in 2020 and 2022.
We aim to assess the treatment outcomes and adverse drug reactions of short-term regimens to drug-resistant tuberculosis (DR-TB) patients.
Method: A cohort of patients diagnosed with rifampicin-resistant or multidrug-resistant tuberculosis (RR/MDR-TB), exhibiting additional fluoroquinolone resistance, intolerance, or documented failure of prior second-line TB therapy, was treated with BPaL or BPaLM regimens between March 2021 and May 2025. Treatment outcomes and associated adverse events were systematically assessed.
Result: A total of 51 patients were included, 35 (94.6%) patients had successful treatment outcome, 14 patients ongoing treatment, and 2 (5.4%) patients died. The most common side-effects included 8 (21.6%) patients experienced gastrointestinal intolerance. As for the neurologic AEs, 1 (2.7%) patient had peripheral neuropathy with numbness in feet. Four (10.8%) patients developed Grade 3 anemia, 2 (5.4%) patients with QTcF prolongation was observed, and one patient 1 (2.7%) experienced elevated AST/ALT.
Conclusion: According to available data on tuberculosis treatment outcomes in Taiwan from 2007 to 2012—prior to the introduction of the BPaL regimen—among 692 patients diagnosed with MDR-TB treated with traditional regimen, 570 (82.4%) achieved successful treatment outcomes, 84 (12.1%) died, 18 (2.6%) treatment failure, and 20 (2.9%) were lost to follow-up.

AE	AE Patient (CTCAE Grade)	Action Required	SAE Patient (CTCAE Grade)	Action required
Gastrointestinal intolerance (nausea, vomiting, loss of appetite)	8 (Grade 2)	Supportive treatment	0	
Anemia	0		4 (Grade 3)	Reduced dosage of Linezolid (300 mg/day) EPO injection blood transfusion
Cardiac abnormalities (QTc prolongation)	2 (Grade 2)	Monitoring	0	
Liver toxicity (AST/ALT elevation)	0		1 (Grade 3)	Held medication for 2 weeks
Peripheral neuropathy	1 (Grade 2)	Stop Linezolid	0	

In patients treated with the BPaL/BPaLM regimen, when compared with the traditional regimen, the treatment rate(94.6%) is higher, death rate(5.4%) is lower and no treatment failure nor lose to follow-up. Although BPaL/BPaLM regimens may be associated with various adverse events, they can be effectively managed through proper monitoring, dose modifications, and supportive care.

TBS-EP530 Ibuprofen and acetylsalicylic acid as adjunctive to anti-tuberculosis treatment: Phase II clinical trial

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We hypothesized that host-directed therapies (HDT) with anti-inflammatory effects could shorten tuberculosis (TB) treatment and improve outcomes when added to standard TB therapy. As part of the SMA-TB EU-funded project (GA847762), we conducted a Phase 2b randomized, double-blind, placebo-controlled trial (NCT04575519) to evaluate the efficacy and safety of two widely available, affordable, and well-tolerated non-steroidal anti-in-

flammatory drugs (NSAIDs) -acetylsalicylic acid (ASA) and ibuprofen (IBU)- as adjuncts to standard-of-care TB treatment in adults with pulmonary TB.
Between 2021 and early 2022, we screened 426 individuals and enrolled 221; 203 (179 drug-susceptible TB [DS-TB], 24 multidrug-resistant TB [MDR-TB]) were included in the final analysis. Participants were recruited at two South African sites (Soweto & Matlosana; n = 140) and one Georgian site (Tbilisi; n = 63). They were randomized in equal proportions to receive placebo (n = 67), ASA (n = 68), or IBU (n = 68) in addition to standard TB therapy. The trial was prematurely halted due to the COVID-19 pandemic and budget limitations.
Neither ASA nor IBU significantly reduced time to a 67 % reduction in a clinical TB score nor time to stable sputum culture conversion (primary endpoints). However, both drugs positively affected several secondary measures of treatment response, although effects varied across the cohort. In subgroup analyses, IBU conferred both short- and long-term clinical benefits in MDR-TB patients, and ASA promoted sustained cavity resolution in DS-TB. Both NSAIDs significantly decreased systemic inflammatory biomarkers during administration. Serious adverse event rates were comparable across all arms.
In conclusion, ASA and IBU did not improve primary clinical outcomes overall but demonstrated subgroup-specific benefits and anti-inflammatory activity. These findings support further investigation of personalized HDT strategies in TB. Alternative dosing regimens and other investigational anti-inflammatory agents warrant evaluation as potential HDT options to optimize patient-specific treatment.

TBS-EP533 Pathobionts and antimicrobial resistance in symptomatic people with and without tuberculosis

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Tens of millions of symptomatic people are tested for tuberculosis (TB) annually yet a minority have TB. Most people without TB (non-TBs) have no further testing, leaving the underlying aetiologies unknown and missed opportunities to better integrate testing for other diseases within TB care cascades. These people, as well as those with TB, may have polymicrobial infections and antimicrobial resistance (AMR), another major public health issue.
We used the research Use Only Respiratory Pathogen ID/AMR panel (Illumina) to profile microbes and AMR markers in sputum of people cross-sectionally investigated for TB pre-treatment.
We found differences between non-TBs (n=238) and TBs (n=82). When TB groups were compared in people without HIV, non-TBs were *Rothia mucuilaginosa*- and *Moraxella catarrhalis*-enriched and TBs *Gemella Haemolysans-enriched. Rothia mucuilaginosa and Gemella Haemolysans* are normal flora but may be associated with disease in certain settings and *Moraxella catarrhalis* is frequently associated with respiratory disease.
Among non-TBs, the top three most abundant pathobionts were *Actinomyces graevenitz*ii, *Fusobacterium nucleatum* and *Ureaplasma murealyticum*, these are microbes frequently associated with disease. Non-TBs had a higher proportion of *s*ulfonamide AMR markers than TBs, whereas TBs had higher proportions of Lincosamide, Macrolide, Fluoroquinolone, Aminoglycoside, Isoniazid, Ethambutol, Para-Aminosalicylic Acid markers than Non-TBs.
This is study is one of the first to landscape potential pathogens in people without TB presenting to TB care in a high burden setting and identify alternative potential causes of their symptoms. This can inform diagnostic algorithms development and future studies on clinical significance.

TBS-EP536 Validation of a DNA methylation signature of active tuberculosis in the buccal mucosa using methylation-specific PCR

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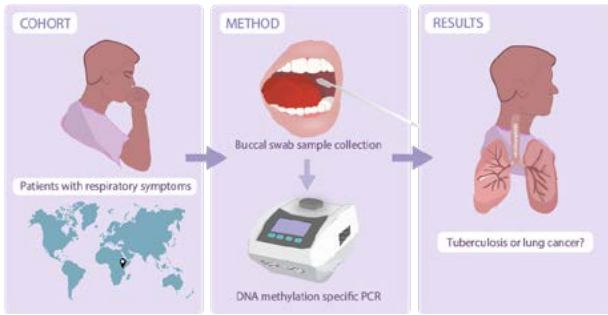
Tuberculosis (TB) has a high mortality if left untreated but is curable with antibiotics. Distinguishing TB from lung cancer (LC) remains a significant clinical challenge, particularly in resource-limited settings. This pilot study investigates the potential of methylation-specific polymerase chain reaction (MSP) as a diagnostic tool to identify TB patients and distinguish them from patients with LC.
In a previous study (Öhrnberg *et al.* 2024), we collected buccal swab samples from patients with pulmonary TB (n=51) and healthy controls (n=10) and mapped their DNA methylation (DNAm) patterns using the Illumina Infinium Methylation EPIC 850 K platform. A DNAm profile distinct from healthy controls was discovered in the buccal mucosa of the TB patients.

We developed a machine learning model to predict symptom scores using the identified DNAm TB profile. The model was trained and evaluated on a validation cohort and two additional independent cohorts, achieving high performance. Further analysis of the model coefficients identified nine CpG sites as strong predictors.
Among these, three sites (CpG 1, CpG 2, and CpG 3) demonstrated the most significant differences in beta-values between TB patients and controls, indicating their potential diagnostic relevance. To validate our findings, we are conducting a MSP-based study in Eldoret, Kenya, where we are evaluating the methylation levels of the top three CpG sites in buccal swab samples collected from patients with active TB and LC patients. TB patients (n=8) and LC patients (n=6) were recruited for an initial analysis.



The machine learning model showed moderate accuracy in predicting symptom scores in both the TB and LC patients, based on DNAm in their buccal mucosa. Further analyses will explore the performance of the MSP model to distinguish TB and LC patients. The findings of this study have potential for further development of DNAm-based diagnostic tools for TB and LC.

TBS-EP539 The Tuberculosis Knowledge and Analytics Platform: TB Nexus Analytics

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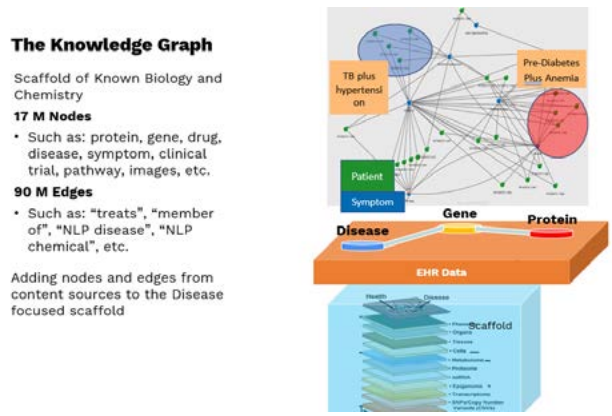
The Tuberculosis Knowledge and Analytics Platform (TB Nexus Analytics) is a cutting-edge tool designed to revolutionize TB research and treatment. At its heart is the Tuberculosis Knowledge Base and Knowledge Graph (TB KBKG), a beta version that's already operational. This innovative "Google Maps for TB" harnesses AI and NLP to compile and organize data from global scientific literature and databases like Drug Bank, CHEMBL, PubChem, STRING, STITCH, KEGG, and more. It provides researchers with an intuitive visual interface to quickly cross-reference information on genes, pathways, and drug targets. It offers researchers a visual interface to quickly cross-reference information regarding genes, pathways, and drug targets, accelerating TB drug discovery by integrating diverse and up-to-date data sources to uncover new insights.
We conducted a workshop at NIRT, offering hands-on training to scientists and showcasing the platform's capabilities.
Central to this platform is the TB Data Commons, which gathers clinical, genomic, and other TB-specific data from different sources. This federated repository will empower researchers to uncover TB biomarkers through comprehensive investigations.
Unlike existing pharmaceutical Data Lakes and Analytics tools, which are often general, TB Nexus Analytics will exclusively target tuberculosis. This tool will analyze omics data, essential for understanding interactions between the TB pathogen and host, crucial for identifying biomarkers necessary for early diagnosis and monitoring. Additionally, the platform seamlessly interfaces with OSPF's TBKBKG. Linking new biomarkers and therapeutic targets will explore novel treatment strategies and enhance predictive modelling.



The TB Nexus Analytics is an innovative tool that has the power to bring together data analytics and scientific knowledge to enhance TB research and treatment. By integrating LLM and fostering collaboration among global researchers, it aims to significantly improve TB diagnosis, identify vital biomarkers, and advance targeted treatment strategies, playing a pivotal role in the fight against TB.

TBS-EP562 Effect of combined inspiratory and expiratory muscle training in pulmonary rehabilitation of active and post tuberculosis

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Background: Pulmonary tuberculosis (TB) frequently results in lasting respiratory impairments such as reduced lung function, decreased exercise tolerance, respiratory muscle weakness, and decreased quality of life even after successful treatment. Inspiratory Muscle Training (IMT) and Expiratory Muscle Training (EMT) are emerging as essential pulmonary rehabilitative interventions.
This study evaluates the role of IMT and EMT individually and in combination in enhancing pulmonary function, exercise capacity, and quality of life in individuals with active or post pulmonary TB.
Methods: A cohort of 18 participants was randomly assigned into three groups (n=6 each). Group 1 received IMT, Group 2 received EMT, and Group 3 received combined IMT and EMT. All groups underwent 20-minute training sessions three times a week for eight weeks (24 sessions total). Assessments were conducted at baseline, mid-point, and post-intervention.
Primary outcomes included respiratory muscle strength, measured via Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP) as well as pulmonary function parameters (tidal volume, Forced Vital Capacity (FVC), exercise endurance, and health-related quality of life.
Results: All groups showed statistically significant improvements ($p < 0.05$) across measured outcomes. Group 1 (IMT) had notable gains in inspiratory strength and lung volumes, while Group 2 (EMT) showed marked improvements in expiratory muscle strength.
However, Group 3 (combined IMT and EMT) exhibited the most significant enhancements in all parameters, including MIP, MEP, FVC, exercise endurance, and quality-of-life scores.
Conclusion: Combined Inspiratory and Expiratory Muscle Training yields superior rehabilitative outcomes in TB and post-TB populations. This integrated approach effectively addresses both restrictive and obstructive lung patterns, making it a valuable adjunct to pulmonary rehabilitation protocols aimed at improving lung functional capacity and overall well-being.

TBS-EP565 Establishment of a model for early warning of onset in population exposed to *Mycobacterium tuberculosis*

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Background: Tuberculosis (TB) develops gradually, and traditional screening fail to detect early *Mycobacterium tuberculosis* (MTB) infections. Early detection in exposed groups is essential for timely intervention.
Design/Methods: We screened 178 close contacts of an active tuberculosis (ATB) case initially and after 3 months using serum exosome-derived TB biomarkers (LAM and LprG), serum proteomics, interferon-gamma release assays (IGRAs), and the tuberculin skin test (TST). Computed tomography (CT) scans and artificial intelligence (AI) tracking technology identified lesion features. A sophisticated deep learning model was developed utilizing a multimodal neural network architecture that integrates convolutional neural networks (CNNs) for the analysis of CT images, alongside fully connected layers for processing structured clinical and biomarker data.
This model was designed with the objective of predicting the onset risk of TB as an early warning system for populations exposed to MTB. The model underwent iterative optimization using data from the cohort.
Results: Out of 178 people, 14 initially had positive serum exosome-derived TB biomarkers despite negative results of CT, TST, and IGRAs. After three months, 10 of these 14 tested positive on TST/IGRAs, indicating that serum exosome-derived TB biomarkers can detect MTB infection earlier than TST/IGRAs. Enhancements in a deep learning model, based on all screening indicators, improved its predictive performance for MTB exposure population of infection onset. The model demonstrated strong generalization and stability through cross-validation and proved effective in early warning and clinical application in an actual MTB-exposed cohort.
Conclusions: Serum exosome-derived TB biomarkers offer a new method for early MTB infection detection. By combining these biomarkers with established tests like IGRAs and TST, and using AI-enhanced CT lesion monitoring within a deep learning framework, a high-performance early warning model can be developed. This model could significantly improve the accuracy and effectiveness of TB screening in at-risk populations.

TBS-EP568 Nutritional status of tuberculosis patients and its associated factors in four districts in Ghana

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Background: Malnutrition is a significant concern in tuberculosis (TB) patients, with a bidirectional relationship between the two conditions. While malnutrition increases the risk of developing active TB by 6 to 10 times, TB also leads to malnutrition. TB patients who are malnourished have delayed recovery and higher mortality rates compared to well-nourished individuals. Hence, WHO recommends addressing malnutrition in TB management to improve treatment outcomes and reduce mortality rates. This study assessed the nutritional status of pulmonary TB patients and its associated factors in four districts in Ghana.
Methods: We reviewed records of TB patients who were registered between January 2021 and August 2024 from four districts and used their contact information to trace them for interviews using a structured questionnaire. We conducted face-to-face and telephone interviews. We extracted data on weight and height from available health and civic records to compute body mass index (BMI). Logistic regression analysis was used to determine the relationship between variables.
Results: Of 607 TB patients surveyed, 253 (41.7%) were aged 49+, 387 (63.8%) were males and 309 (50.9%) were low-income earners. The study found 206 (33.9%) patients to be underweight, 304 (50.1%) malnourished based on BMI indices while 272 (44.8 %) and 310 (51.1%) experienced weight loss and food insecurity respectively. A total of 281 (46.3%) indicated having consumed balanced diets while 228 (37.6%) had received moderate level of support during treatment. One-third of patients 183 (33.8%) had good knowledge of nutrition. Significant predictors of malnutrition included residence in Jasikan (aOR=4.19, p<0.001) or Kpando (aOR=3.72, p<0.001), male gender (aOR=2.02, p=0.003), being unemployed (aOR=2.4, p=0.02), having had tertiary education aOR=0.4, p=0.02), and limited healthcare access (aOR=0.4, p=0.003).
Conclusion: More than half of TB patients were malnourished. There is the need to integrate nutrition assessment and support systems into TB management in the study districts.

TBS-EP571 Maternal and infant outcomes in acute hematogenous disseminated pulmonary tuberculosis during pregnancy

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Background: The outcomes of acute hematogenous disseminated pulmonary tuberculosis (HDTB) in pregnancy are not well understood. Our study aims to investigate the clinical features and outcomes for pregnant women with acute HDTB, examine the link between these features and the prognosis for both mothers and infants, and share insights to enhance diagnosis and treatment.
Design/Methods: We analyzed the clinical data of 65 pregnant women with acute HDTB admitted to three Chinese hospitals between January 2013 and December 2022, focusing on clinical characteristics, treatment outcomes, and their interrelationships.
Results: In this study of 65 pregnancies with acute HDTB, 72.3% (47/65) followed *in vitro* fertilization embryo transfer (IVF-ET), and 63.1% (41/65) were associated with tuberculous meningitis. Common clinical symptoms included fever (98.5%), cough (63.1%), vaginal bleeding (46.2%), and headache (63.1%). Cranial enhanced MRI detected tuberculous meningitis in 83.3% (40/48) of cases, compared to 65.2% (30/46) via lumbar puncture. The positive rate for interferon-gamma release assays (IGRAs) was 81.7% (49/60). Adverse pregnancy outcomes included 44.6% (29/65) spontaneous abortions, 24 induced abortions, 12 deliveries (including twins), and 4 stillbirths (30.8%). Among live births, 61.5% (8/13) were low birth weight, 38.5% (5/13) had congenital tuberculosis (with 3 fatalities and 1 mobility disorder), and 7.69% (1/13) had congenital heart disease. Fisher's analysis revealed that adverse fetal outcomes were significantly more common in acute HDTB pregnancies with vaginal bleeding (100%) compared to those without (76.92%), and in cases with reduced amniotic fluid (100%) compared to those without (71.43%), with both differences being statistically significant (P<0.05).
Conclusions: Out of 65 pregnant acute HDTB patients, 47 (72.3%) underwent IVF-ET. Adverse pregnancy outcomes are common, and ultrasound monitoring of amniotic fluid can assess fetal health. Vaginal bleeding and reduced amniotic fluid may indicate potential fetal issues.

TBS-EP577 Development of a loop-mediated Isothermal amplification (LAMP) assay for the detection of pepQ gene in Mycobacterium tuberculosis

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Bedaquiline is one of the components of the Bedaquiline-Pretomanid-Linezolid (BPaL) treatment regimen recommended for treating multidrug-resistant tuberculosis (MDR-TB), which was rolled out in the Philippines in 2021. As of writing, there have been no studies conducted on the epidemiology of bedaquiline resistance in the country due to the lack of low cost methods to identify drug resistant tuberculosis.

We aimed to develop a loop-mediated isothermal amplification (LAMP) assay to detect the presence of the pepQ gene specific to *Mycobacterium tuberculosis*, wherein mutations are associated with bedaquiline resistance. This assay may be used as a diagnostic assay for the presence of *Mycobacterium tuberculosis* in clinical samples. One LAMP primer set targeting pepQ was specifically designed to include one single nucleotide polymorphism (SNP) associated with bedaquiline resistance. This set was evaluated in silico then subsequently optimized with a synthetic gene fragment as a positive control.

External primers (F3 and B3) were validated using quantitative PCR using dilutions of the synthetic positive control (10^8 - 10^0 DNA copies/uL). Optimization steps involved variations of the reaction temperature (63°C-65°C), incubation time (30, 40, 50 and 60 minutes), Bst polymerase type (Bst 1 and Bst 2), and total reaction volume (25 uL and 12.5 uL).

Using Bst 1, optimized conditions were found to be 63°C for both 50 and 60 minutes of incubation with an analytical sensitivity of 10^5 DNA copies/uL. For clinical diagnosis, this analytical sensitivity must be improved. To address this, Bst 2 was used to investigate the possible variations in the optimized conditions from Bst 1.

Preliminary testing showed an optimized incubation temperature from 63°C-65°C. The succeeding optimization steps are yet to be conducted. This assay, as a preliminary step, may further be applied in downstream applications which might be able to detect the specific mutations for bedaquiline resistance.

TBS-EP580 Factors that impact the expansion of coverage for preventive treatment of TB in the Kyrgyz Republic

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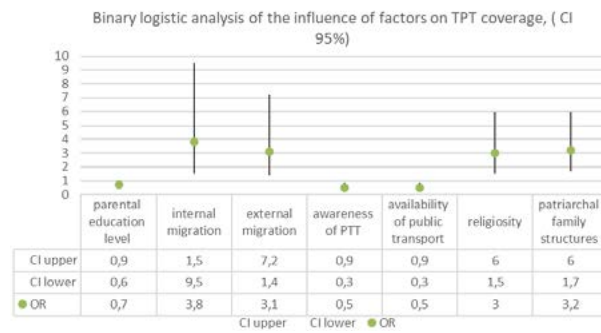
Background: TB preventive treatment, including chemoprophylaxis for people at risk of TB, is a key component of the fight against the spread of this disease. In Kyrgyzstan, in 2019–2022, the average number of contacts of patients with bacteriologically confirmed pulmonary TB and screened for TB was 3.2–3.5 people per index case, of which children account for 35–37%.

Methodology: This cross-sectional study aimed to identify factors influencing TB preventive treatment coverage. Data were collected using quantitative and qualitative methods across all regions. Respondents—parents of child contacts—were selected randomly. Descriptive statistics, Pearson's chi-square test, and binary logistic regression were used for analysis in SPSS v22.0.

Results: A total of 289 respondents participated, covering all regions. Key barriers to tuberculosis preventive therapy coverage included migration status (OR = 3.8; CI = 1.5–9.5), religiosity (OR = 3.0; CI = 1.5–6.0), patriarchal family structure (OR = 3.2; CI = 1.7–6.0), and lack of information (OR = 4.3; CI = 1.6–11.9). Protective factors that reduced the likelihood of refusal or interruption of treatment included parental education (OR = 0.7; CI = 0.6–0.9), awareness of TPT (OR = 0.5; CI = 0.3–0.9), and access to public transport (OR = 0.5; CI = 0.3–0.9). Complex diagnostic and testing procedures further complicated the timely initiation of chemoprophylaxis.

There are no clear mechanisms and criteria for regular analysis of data on the cascade of contact care and preventive treatment of children. Automation and digitalization of accounting processes are recommended to improve monitoring and reporting.



Conclusion: Barriers to TB preventive treatment in Kyrgyzstan are multifactorial, including social, logistical, and informational challenges. Improving access to care, simplifying diagnostic pathways, enhancing public awareness, offering psychosocial support, and increasing program funding are essential to expanding TPT coverage and strengthening TB prevention efforts.

TBS-EP583 Clinical features of pulmonary tuberculosis and nanostructural characteristics of multidrug-resistant Mycobacterium tuberculosis strains

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Background: The development of effective short regimens for tuberculosis (TB) treatment is an urgent task. However, no rapid methods are currently available to assess the biological activity of Mycobacterium tuberculosis for the purpose of determining optimal treatment duration.
Aim. To analyse clinical and instrumental features of the infectious process course in pulmonary tuberculosis (TB) and to characterise of *M.tuberculosis* with multidrug resistance/resistance to rifampicin (MDR/RR), pre-extensively drug resistance (pre-XDR) architectonics and morphogenesis.
Materials and methods: 40 MDR/RR-TB, pre-XDR-TB patients (30 men (75%), 10 women (25%) aged 34 to 61 years) were enrolled in the study (Table). The results of diagnostic material microbiological examination, clinical, chest X-ray examination of included patients were analysed. The architectonics and morphogenesis of *M.tuberculosis* were studied.
Results: Median time [IQR] to culture conversion in patients with favourable treatment outcome (FTO) was 54.0 [28.0;84.0], with unfavourable treatment outcome (UTO)-123.0 [87.0;231.3] days (p=0.0001). Significant differences in mycolic acid layer thickness were found when transferring from mycobacilli (12 [10;12] nm) to rounded morphovars (30 [30;40] nm, p=0.003). Mycobacteria surface stiffness coefficient was significantly higher in patients with UTO than in patients with FTO (Me-58.3 [48.2;72.1] pN/μm vs. Me-7 [5;7.4] pN/μm) (Figure). The surface stiffness coefficient of the *M. tuberculosis (H37Rv)* strain susceptible to anti-TB drugs was 5–7 pN/μm.

Table. Baseline characteristics of patients

Total enrolled	Group 1, n (%) * 22 (100)	Group 2, n (%) * 18 (100)	P-value**
Male	15 (68.2)	15 (83.3)	>0.05
Age, mean (range)	48.2 (+-9.1)	47.8 (+-9.1)	>0.05
Mean BMI mean (range)	22.1 (+-4.9)	20.5 (+-3.4)	>0.05
Sputum smear positive at baseline	11 (50.0)	13 (72.2)	>0.05
pre-XDR-TB at baseline	11 (50.0)	7 (38.9)	>0.05
HIV-positive	2 (9.1)	3 (16.7)	>0.05
HCV-positive	3 (13.6)	6 (33.3)	>0.05
Alcohol abuse in anamnesis	8 (36.4)	9 (50.0)	>0.05
Diabetes mellitus	4 (18.2)	2 (11.1)	>0.05
Cavity	**8 (36.4)**	**13 (72.2)**	**0.024**

*Figures are presented as number (percentage), if not indicated otherwise
**χ^2 used for calculation of the difference between groups

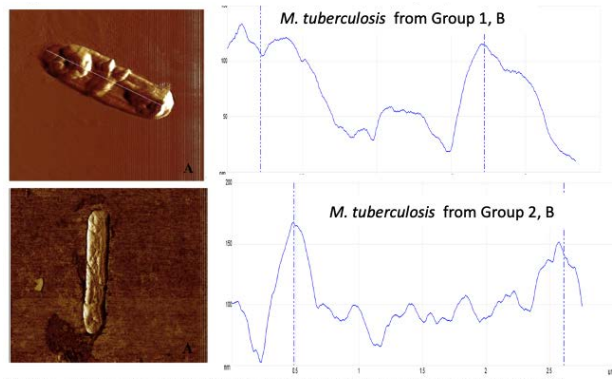

Figure. Surface topography of the rod-shaped form of *M.tuberculosis* (A) and analysis of cross-sectional microprofiles of the bacterial structure (B)

Conclusion: Among bacillary mycobacteria morphovars there is a shift of mechanically rigid zones to the middle of the bacterial structure. Changes in the architectonics of mycolic acids, the appearance of forms with a rigid envelope may correlate with the virulence of mycobacteria and the clinical course of tuberculosis.

TBS-EP586 Long term impact of pulmonary TB on health-related functioning and well-being in four African countries

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Introduction: Pulmonary TB continues to negatively affect the health-related quality of life (HRQoL) of survivors, even after treatment completion.
Objective: To describe health-related functioning and well-being in TB survivors 4-7 years after completing TB treatment.
Methods: A cross-sectional study conducted at four African countries—The Gambia, Mozambique, Tanzania, and South Africa. The study included adults (≥18 years) who had completed treatment for pulmonary TB between and 04/2018 and 07/2020. Data were collected using three validated instruments: Medical Outcomes heath survey (SF-12), Kessler Psychological Distress Scale (K10), and Sheehan Disability Scale.
We report mean scores for the Mental Component Summary (MCS), Physical Component Summary (PCS) scores from the SF-12, proportion experiencing mild (20-24), moderate (25-29) or severe (≥30) psychological distress.

Results: A total of 470 patients were included, 64% were male (301/470), with a mean age of 41.4 years (SD 11.8). Average MCS and PCS scores were similar for the 6–7 years (56.6 ± 8.1 and 51.4 ± 8.4) and the 4-5 years (55.5 ± 8.2 and 51.7 ± 8.5) group, respectively. The two most concerning findings were that 15-20% of TB survivors continue to experience severe psychological distress (≥30), and 28-36% still consider the financial burden of TB on their households to be severe. However, some social consequences of TB, such as its impact on work, family, and social life, appear to have fully resolved.

		4- and 5-years after TB treatment completion (n=353)	6- and 7-years after TB treatment completion (n=162)
Employment	Employed – n (%)	253 (89.7)	122 (88.4)
	Unemployed – n (%)	29 (10.3)	16 (11.6)
Changed jobs in the last 6 months?	Yes – n (%)	15 (6.0)	5 (4.2)
If employed, hours worked per week	Mean (SD)	49.6 (22.4)	49.6 (22.4)
Days unproductive in the last week	Mean (SD)	1(0.0)	1(0.0)
Long-term financial impact of TB	None/little	142 (50.4)	53 (39.3)
	Moderate	59 (20.9)	33 (24.4)
	Severe/very severe	81 (28.7)	49 (36.3)
Health-related quality of life (SF-36)			
Physical Component Summary	PCS – Mean (SD)	51.7 (8.5)	51.4 (8.4)
Poor physical functioning*	≤50 – n (%)	83 (23.5)	36 (22.2)
Mental Component Summary	MCS – Mean (SD)	55.5 (8.2)	56.6 (8.1)
Poor mental functioning*	≤50 – n (%)	64 (18.1)	22 (13.6)
Psychological distress	<20 normal	258 (73.1)	124 (76.5)
	20-24 mild distress	19 (5.4)	10 (6.2)
	25-29 moderate distress	4 (1.1)	3 (1.9)
	≥30 severe distress	72 (20.4)	25 (15.4)
Long-term impact of TB on work/ school	Mild (0-3)	251 (96.2)	124 (93.9)
	Moderate (4-6)	6 (2.3)	5 (3.8)
	Markedly (7-10)	4 (1.5)	3 (2.3)
Long-term impact of TB on family life	Mild (0-3)	277 (98.6)	133 (96.4)
	Moderate (4-6)	2 (0.7)	4 (2.9)
	Markedly (7-10)	2 (0.7)	1 (0.7)

Conclusions: Health-related functioning is generally lowest at the start of TB treatment, improves throughout treatment, but shows limited recovery after its completion. In this and other work, we find that a subset of TB survivors experiences a decline in HRQoL, particularly in mental health, around 30 months after completing TB treatment. Further research is needed to assess whether poor mental health and financial strain reported 4-7 years post-treatment are directly linked to TB.

TBS-EP589 Enrichment of *M. tuberculosis* in patient sputa using a limiting dilution assay

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The limiting dilution most probable number (MPN) assay is a method of detecting the presence of differentially culturable tubercle bacteria (DCTB) in patient sputum. These DCTB can grow in liquid media, with and without culture filtrate (CF) supplementation, but not on solid media.

In a preliminary study, 16S sequencing was performed on 20 patient samples recovered following the completion of MPN assays, from the plate wells representing both supplementation with and without CF. Additionally, 3 of the corresponding original patient sputum samples were also sequenced and analysed.

Mycobacterium tuberculosis was detected in all the 40 isolates, with 75% of the isolates being drastically enriched for *M. tuberculosis* (>82% of identified sequence reads per isolate). For all but 2 of the samples, there was minimal difference in the level of *M. tuberculosis* enrichment between the CF supplemented/not supplemented isolates. The predominate species identified in the supplemented isolates of these two samples were *Paenibacillus polymyxa* and *Bacillus subtilis*. The remaining samples, with a minimal *M. tuberculosis* presence, were dominated by *Ralstonia pickettii*, *Rhodococcus hoagie*, *Methylobacterium radiotolerans* and *Afipia genosp*.

Analysis of the three sputum samples revealed trace or undetectable levels of *M. tuberculosis*, however both of the corresponding MPN isolates for each sample was completely dominated by *M. tuberculosis*. While samples from both HIV positive and negative persons could be enriched with *M. tuberculosis*, the 10 isolates (25%) for which this was not the case were all from HIV negative persons.

This investigation shows that, in most cases, the MPN assay can be used to enrich patient sputum samples for the detection of *M. tuberculosis*, which is a valuable capability when trying to detect low levels of bacteria in patient samples.

TBS-EP592 Bridging diagnostic gaps of drug-resistant pulmonary tuberculosis with clinical diagnosis in a low-and middle-income state, Southwest, Nigeria: A secondary data analysis

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Introduction: Drug-resistant tuberculosis (DR-TB) poses a significant challenge to global TB control efforts, particularly in low- and middle-income countries where diagnostic resources are limited thereby widening treatment gap. This has increased morbidity and mortality due to TB in Sub-Saharan Africa. We sought to evaluate the role of clinical diagnosis in identifying DR-TB in pulmonary TB cases missed by the sputum GeneXpert MTB/RIF assay in Ekiti State, Nigeria.
Methods: A secondary data analysis was conducted using the 2024 National Tuberculosis, Leprosy and Buruli Ulcer Control Programme (NTBLCP) register in Ekiti State. Data on demographics, diagnostic methods, and resistance patterns were extracted and analyzed using descriptive statistics.
Results: Among 28 DR-TB cases identified, GeneXpert MTB/RIF assay detected only 53.6% (15/28), missing 46.4% (13/28), which were subsequently identified through clinical suspicion followed by Line Probe Assay+/- culture. MDR-TB accounted for 46.4% (13/28), rifampicin mono-resistance for 39.3% (11/28), and isoniazid mono-resistance for 14.3% (4/28). Two cases of pre-XDR TB were observed among people living with HIV, both of whom had false-negative GeneXpert results. The average diagnostic delay from GeneXpert testing to LPA-based diagnosis was 16 days.

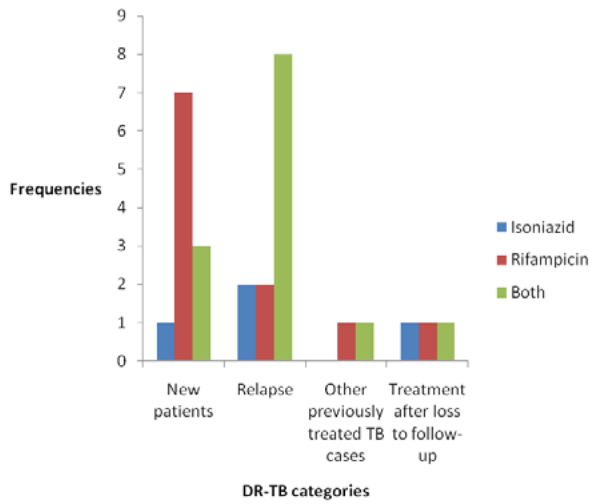

Figure 1: Distribution of the categories of DR-TB patients with drug-resistance patterns using LPA in Ekiti State, Nigeria, 2024

Conclusion: Clinical evaluation is critical in bridging diagnostic gaps created by false-negative GeneXpert results, ensuring timely identification and treatment of DR-TB.

TBS-EP595 Diagnostic potential of hematological counts and ratios in pediatric tuberculosis: A five-year retrospective study

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The diagnosis of tuberculosis (TB) in children remains a challenge due to the often nonspecific clinical presentation and the difficulty in obtaining reliable biological samples. In recent years, attention has shifted toward the potential of basic hematological parameters and their derived ratios as supportive diagnostic tools. Indicators such as platelet count (PLT), leukocyte count (LEU), erythrocytes (ERY), haemoglobin, mean platelet volume (MPV), and ratios like neutrophil-to-lymphocyte (NLR), monocyte-to-lymphocyte (MLR), and platelet-to-lymphocyte (PLR) have shown promise in differentiating between various forms of TB and in assessing disease severity.
This retrospective study evaluated 446 pediatric patients hospitalized between 2020 and 2024 at the Clinic of Children's Tuberculosis and Respiratory Diseases. The study population included 217 children with active TB (including 26 with disseminated forms), 60 with latent TB, 18 with mycobacteriosis, and 125 controls. The control group consisted of symptomatic patients without confirmed TB and individuals who had contact with TB-positive persons. The average age of patients with active TB was 7.1 ± 5.1 years.
Using multivariable linear regression adjusted for age, sex, and comorbid inflammatory conditions, we found that the following hematological markers were significantly different in children with active TB compared to controls: platelet count ($p = 0.022$), lymphocyte count ($p = 0.044$), PLR ($p = 0.010$), and NLR ($p = 0.001$). These findings underline the diagnostic value of simple, routinely avail-

able blood parameters in pediatric TB and highlight their potential role in clinical decision-making, especially in resource-limited settings.

This project was supported by the grants APVV-18-0084, APVV-22-0342, VEGA-1/0093/22, VEGA/1/0049/25, and by the EU NextGenerationEU through the Recovery and Resilience Plan for Slovakia under the project No. 09I03-03-V02-00036.

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TBS-EP598 Polystyrene particles alter mycobacterial lipidic cell wall composition

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Introduction: The genus Mycobacterium comprises both pathogenic and non-pathogenic species, characterized by their highly hydrophobic cell wall enriched with diverse lipids. Micronanoplastics, as pervasive environmental pollutants, have shown to affect microbial communities and pose a risk to human health[1].

In this study, we examine the effects of nano-sized polystyrene (PS) particles on the mycobacterial phenotype, with a focus on changes in the composition of their lipid-rich cell wall.

Materials and methods: *Mycobacterium smegmatis* mc^2 155, a non-pathogenic fast-growing model for *Mycobacterium tuberculosis*, was cultured in Tryptic Soy Broth (TSB) medium or Middlebrook 7H9 medium supplemented with albumin-dextrose-catalase (ADC). Cultures were exposed to 100 µg/mL PS and incubated at 170 rpm and 37ºC for 72 hours. Bacterial biomass was harvested, followed by total lipid extraction through filtration and decantation. Lipid profiles were monitored by using thin-layer chromatography (TLC) with different elution systems of different polarity.

Results: *M. smegmatis* growth was influenced by both, culture media and PS exposure. While higher bacterial growth was observed in TSB compared to 7H9 in the absence of PS; the presence of PS triggered an increased bacterial growth in TSB but reduced it in 7H9 medium.

Additionally, PS exposure altered lipid expression: the presence of some polar lipids was reduced in TSB, while both apolar and polar lipids, including glycopeptidolipids and phosphatidylinositol mannosides, showed decreased expression in 7H9.

Conclusions: Both the culture medium and PS exposure affect the lipid composition of *M. smegmatis* cell wall. Notably, PS presence tends to decrease expression of diverse key cell wall lipids, suggesting an impact on host-mycobacteria interaction.

TBS-EP601 Population pharmacokinetics of isoniazid in TB patients: Accounting for age, sex, weight, diabetes, and HIV

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Background: We previously found that individuals with tuberculosis (TB) and poorly controlled diabetes mellitus (DM) had a lower risk of adverse drug reactions, presumably because of low drug concentrations. To investigate this, we developed a compartmental population pharmacokinetics (PopPK) model for isoniazid (INH) concentrations.

Methods: We included culture-confirmed, drug-susceptible, pulmonary TB participants from the RePORT-Brazil observational cohort, sparsely sampled during month 1; they received standard TB treatment. We developed a one-compartment PopPK model, with absorption rate constant (ka), clearance (Cl), and volume of distribution (Vd) parameters.

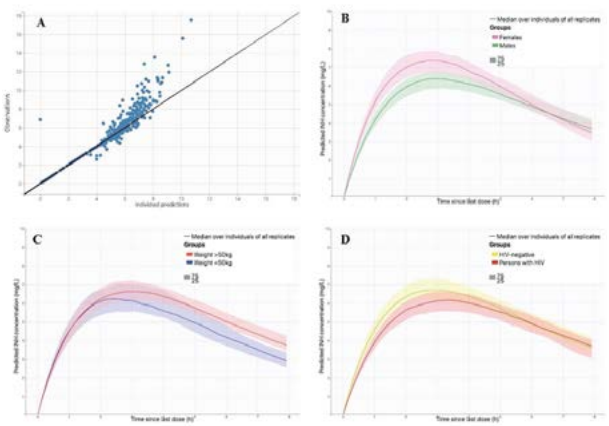
Random effects captured inter-individual variability. Age, sex, weight, body mass index (BMI), DM-, and HIV-status at baseline were analyzed. INH concentration was quantified by liquid chromatography-mass spectrometry (SCIEX6500 Qtrap, Redwood City, CA). Time since last dose (in hours) was self-reported, and samples below quantification levels were excluded. Stochastic approxi-

mation of the expectation maximization (SAEM) algorithm in Monolix® was used for model parameter estimation, and Simulx®, for simulations.

Results: There were 333 study participants. The final PopPK model with best fit estimated ka of 0.59, Cl of 6.12L/h, and Vd of 5.62L, and included age, sex, weight, and HIV status, but not DM. Persons with HIV had significantly lower absorption rate compared to HIV-seronegative individuals (-0.12, 95% Confidence Interval (CI) -0.23;-0.004, p=0.04), females had lower Vd compared to males (Vd -3.9 95%CI -6.75;-1.05, p<0.001), age was associated with decreased Vd (-0.039, 95%CI -0.07;-0.0077, p=0.01), while weight, with increased Vd (0.35, 95%CI 0.2; 0.51, p<0.001) (Figure 1).

The inter-individual variability was considerable, with omega values for ka (0.33, Coefficient of Variation (CV)= 55%), Vd (2.85, CV= 51%), and Cl (1.36, CV=22%).

Figure 1. Model performance and simulations of INH concentration stratified by sex, weight, and HIV-status.



Legend. (**A**) Model performance. Observations vs. individual predictions of INH plasma concentrations from the PopPK model. Simulated predicted concentrations stratified by sex (**B**), weight (**C**), and HIV-status (**D**). The stratified concentrations by age are not displayed.

Conclusions: This PopPK model captured variability in INH absorption, distribution, and clearance among patients with pulmonary TB in Brazil. Age, sex, weight, and HIV-status influenced INH concentrations, but DM did not.

TBS-EP603 Single-cell transcriptomic profiling identifies immune signatures in latent Mycobacterium tuberculosis infection and active tuberculosis

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Background: Latent Mycobacterium tuberculosis (*Mtb*) infection (LTBI) results in varied outcomes owing to different host immune responses. However, the immune mechanisms underlying the progression from LTBI to active tuberculosis (ATB) remain poorly understood in humans.

Methods: We employed single-cell RNA sequencing to profile immune cell populations in peripheral blood from healthy controls (HC), LTBI, and ATB. We performed unsupervised clustering based on gene expression profiles using Seurat.

We conducted enrichment analyses on differentially expressed genes of CD8+ T cells across different groups to identify functional changes they mediate. Mfuzz was utilized to classify genes into distinct groups according to expression similarity to examine dynamic expression changes at various infection stages. SCENIC was employed to predict transcription factor activity and regulatory networks in different CD8+ T cell subsets.

Findings: Cluster analysis delineated 10 cell subsets. Analysis of CD8+T cells revealed that genes highly expressed in LTBI were predominantly enriched in the regulation of innate immune response, particularly natural killer cell-mediated immunity and cytotoxicity.

Analysis of this pathway highlighted KLRC2, which was upregulated in CD8+T cells in LTBI compared to HC and ATB patients. In the CD8+T cell subset with elevated KLRC2 expression, transcription factors such as EOEMS, IRF2, and IKZF2 exhibited high activity.

We hypothesize these cells possess potent cytotoxic functions and memory cell characteristics, persisting in the bloodstream to maintain the latent state following Mtb infection.

Interpretation: We propose that the frequency of CD3+ CD8+ KLRC2+ T cells in peripheral blood may serve as a novel biomarker to distinguish LTBI from HC and ATB. These cells contribute to maintaining the latent infection state, and their loss may correlate with the transition from latent infection to active.

This study enhances our understanding of the immune landscape across different *Mtb* infection states and may inform future prophylactic treatment strategies.

TBS-EP606 Latent tuberculosis infection retains cytotoxic molecule expression and functionality lost during active disease

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Introduction: Latent tuberculosis infection (LTBI) remains a major global health concern. Studies using murine models have shown that $CD8^+$ T cells are essential for preventing LTBI reactivation. In contrast, active tuberculosis (TBA) is associated with reduced frequency and functionality of these cells. This study aimed to evaluate the capacity of cytotoxic molecule production (transcriptional/protein levels) by cells from individuals with LTBI or TBA, both at baseline and following exposure to *Mycobacterium bovis* BCG.
Methods: Peripheral blood mononuclear cells (PBMCs) and plasma were obtained from patients with TBA (n=80), QuantiFERON-positive contacts (LTBI, n=20), and QuantiFERON-negative contacts (n=20). Expression of *GZMA*, *GZMB*, *PRF1*, and *GNLY* (by qPCR) and soluble levels of granzyme A/B, perforin, granulysin, sFas, sFasL, and cytokines associated with cytotoxicity (TNF, IFN-g, IL-2, IL-4, IL-6, IL-10, IL-17) (by flow cytometry) were assayed. A subset of PBMCs from LTBI (n=5) and TBA (n=10) individuals was cultured with BCG to assess functional responses.
Results: Compared to TBA, PBMCs from LTBI individuals exhibited significantly higher transcriptional levels of *GZMA*, *GZMB*, *PRF1*, and *GNLY* ($p<0.0001$). Similarly, soluble protein levels of cytotoxic molecules (granzymes, perforin, granulysin, sFas, sFasL) and related cytokines were elevated in LTBI. Upon BCG stimulation, LTBI PBMCs maintained high levels of cytotoxic molecules, whereas TBA PBMCs failed to mount a comparable response ($p<0.05$).
Conclusion: Individuals with LTBI, but not those with TBA, preserve the ability to produce cytotoxic molecules in response to mycobacterial stimulation.
This suggests that LTBI is associated with an active and functional cytotoxic immune response, potentially contributing to the containment of *Mycobacterium tuberculosis* infection.

TBS-EP609 Harnessing AI for rapid, consistent, and efficient scientific writing: Large language models for TB trial protocol generation

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Background: Developing tuberculosis (TB) clinical trial protocols demands specialized expertise and considerable resources. While general-purpose large language models (LLMs) may reduce manual workload, they typically lack TB-specific training and raise privacy concerns when used with sensitive documents. Recent innovations such as low-rank adaptation (LoRA) and retrieval-augmented generation (RAG) address these limitations by enhancing domain-specific accuracy. Recent advances in efficiency further allow private, offline deployment on modest hardware. Using semantic similarity and qualitative evaluation, we developed a robust, fine-tuned LLM augmented with RAG that reliably drafted key sections of TB clinical trial protocols.
Objectives/Methods: Using a computer with a single graphics processing unit, we developed a LoRA- and RAG-enhanced text generation pipeline and evaluated its performance when drafting TB clinical trial protocol sections.
We compared three models:
1. Mistral-7B;
2. Mistral-7B enhanced with LoRA and fine-tuned on 13 phase III TB protocols (2014–2024); and;
3. A RAG-augmented, LoRA-enhanced Mistral-7B model incorporating five TB guideline documents as external context.
Model outputs were generated in response to prompts targeting efficacy objectives, treatment-stopping rules, and inclusion/exclusion criteria. These outputs were then evaluated for their accuracy, relevance, and semantic similarity to human-generated content.
Results: TB-specific fine-tuning substantially improved the factual accuracy, plausibility, and semantic alignment of LLM-generated protocol sections. Notably, Model 3 outperformed the other models on both familiar and novel tasks, including the generation of inclusion/exclusion criteria for a drug absent from the training set and retrieval corpus.

Model	Prompt (Condensed)*	Output (Condensed)*
Model 1 Mistral 7B	Draft a concise primary efficacy objective for a Phase 3 clinical trial evaluating a 4-month BPaLM (bedaquiline, pretomanid, linezolid, and moxifloxacin) regimen for MDR TB.	"...to evaluate the proportion of participants who achieve a favorable outcome at 6 months following a 4-month regimen of..."
Model 2 Mistral + LoRA		"... to evaluate the efficacy of a 4-month regimen in achieving favorable treatment outcome in adult patients with..."
Model 3 Mistral + LoRA + RAG		"...to evaluate the efficacy of a 4-month regimen in achieving bacteriological cure at 26 weeks post-treatment initiation..."
Model 1	List 3 specific conditions or events in which participants should discontinue treatment or study drug. These criteria should reflect typical SAEs or lab abnormalities observed with investigational TB medications.	"...liver enzymes (ALT, AST) more than 5x the ULN then they must permanently discontinue treatment due to the risk of liver failure"
Model 2		"...if they develop severe neurotoxicity, such as peripheral neuropathy, optic neuritis, or encephelopathy."
Model 3		"...discontinuation of investigational drug due to severe adverse events: -severe hepatotoxicity, -severe nephrotoxicity..."
Model 1	List 2 inclusion and 2 exclusion criteria for a Phase 3 clinical trial evaluating quarbodepistat in combination with bedaquiline and delaminid in the treatment of MDR-TB.	"...intolerance to any of the study drugs or their excipients or a history of SAEs to similar drugs (quinolones or macrolides)"
Model 2		"Pregnant or breastfeeding women, or women of childbearing potential not using effective contraception."
Model 3		"Participants with a history of significant cardiac disease or QTc prolongation."

*Condensed outputs are a representative sample of prompt or output text, with full text being available in the write-up.
**For the full model, language was slightly tweaked to include the phrase "treatment discontinuation"

Conclusion: Domain-adapted LLMs offer a practical solution for accelerating the development of TB clinical trial protocols. Our pipeline showed strong potential for drafting key sections offline and, therefore, for maintaining the privacy of our data. This work demonstrates how LLMs can be safely applied in global health contexts.

TBS-EP612 New tuberculosis diagnostic technologies enable decentralized participant-driven active case detection vaccine efficacy trials with asymptomatic TB endpoints

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Tuberculosis (TB) vaccine efficacy trials traditionally rely on symptomatic, microbiologically confirmed TB disease endpoints. These require large cohorts and long follow-up, making trials costly and complex. However, a recent shift in WHO guidelines recognizes TB as a continuum of disease, with *asymptomatic TB* (aTB) - bacteriologically confirmed TB without reported symptoms - emerging as a biologically active and epidemiologically important phase. The characteristics of aTB are uncertain, but aTB may be twice as prevalent as symptomatic TB and may contribute to transmission and morbidity. Including aTB as a trial endpoint could accelerate vaccine development by enabling earlier detection of vaccine effects in smaller, shorter, and more cost-effective trials.

This paper proposes a decentralized, participant-driven trial model leveraging recent diagnostic innovations to detect both symptomatic TB (sTB) and aTB. We examine how emerging technologies such as tongue swab-based molecular tests, cfDNA assays, portable chest X-ray with CAD, and digital tools like cough apps and wearables, may support sensitive, repeatable, and non-invasive screening beyond traditional trial settings (figure).

Incorporating aTB as a composite primary or secondary endpoint - combined with decentralized testing and digital data collection - may radically reduce reliance on symptom-driven screening and enhance representation of vaccine impact across the full TB disease spectrum. Challenges include validating tests for low-burden disease, managing intermittent bacterial shedding, and producing regulatory-grade evidence. Nonetheless, advancements in test sensitivity, usability, and decentralized trial infrastructure support the feasibility of consistently detecting aTB. Repeated testing and digital integration also facilitate real-time efficacy and safety monitoring.

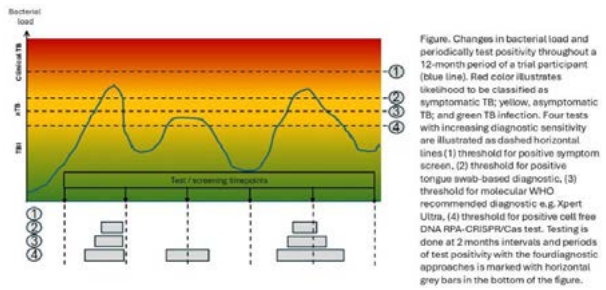

Figure. Changes in bacterial load and periodically test positivity throughout a 12-month period of a trial participant (blue line). Red color illustrates likelihood to be classified as symptomatic TB; yellow, asymptomatic TB; and green TB infection. Four tests with increasing diagnostic sensitivity are illustrated as dashed horizontal lines (1) threshold for positive symptom screen, (2) threshold for positive tongue swab-based diagnostic, (3) threshold for molecular WHO recommended diagnostic e.g. Xpert Ultra, (4) threshold for positive cell free DNA RPA-CRISPR/Cas test. Testing is done at 2 months intervals and periods of test positivity with the fourdiagnostic approaches is marked with horizontal grey bars in the bottom of the figure.

We outline a roadmap for integrating these innovations into TB vaccine trials, emphasizing research priorities such as better characterising aTB, diagnostic validation in early TB, usability of self-collection tools, and development of digitally triggered composite endpoints to enable faster, scalable, and more representative TB vaccine evaluations.

TBS-EP614 Predictive modeling of tuberculosis prevalence among medical workers in the Vinnytsia Region, Ukraine: Insights from 2007–2029

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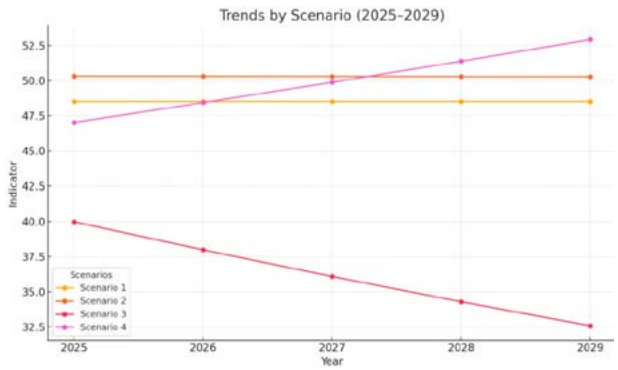
The aim of our study was a detailed predictive analysis of tuberculosis (TB) prevalence trends among medical workers in the Vinnytsia region of Ukraine over the next five years (2025–2029), utilizing historical incidence data spanning 2007–2023.

With linear regression and scenario-based modeling, four distinct scenarios were developed to model future trends: (1) maintenance of current trends reflecting recent disruptions, (2) reversion to pre-COVID-19 patterns observed from 2007–2019, (3) an optimistic scenario assuming improved healthcare interventions and military conflict resolution, and (4) a pessimistic scenario accounting for potential worsening due to ongoing war and healthcare challenges.

Historical data reveal a volatile incidence among medical workers, with a peak of 58.4 per 100,000 in 2010, a sharp decline to 21 in 2022, and a rebound to 44.3 in 2023, while the general population showed relative stability, ranging from 47.3 to 65.6 per 100,000, with a 2023 rate of 53. Projections indicate that under the current trend scenario, medical worker incidence stabilizes at approximately 48.5 per 100,000, while general population rates may decline to 42.0 by 2029. The optimistic scenario, driven by enhanced TB screening, treatment access, and support from initiatives like WHO programs, predicts a significant reduction to 32.57 for medical workers and 44.15 for

the population. In contrast, the pessimistic scenario, influenced by disrupted healthcare services and increased exposure risks, forecasts an increase to 52.91 and 59.66, respectively. These models highlight the critical role of external factors, such as the ongoing war, in shaping TB dynamics in the Vinnytsia region.



In conclusion we suggest that sustained public health investments, including mobile clinics and training for medical personnel, are essential to curb rising prevalence, particularly under adverse conditions.

TBS-EP616 Knowledge of tuberculosis prevention and control among public service vehicle operators in the South Rift Valley, Kenya

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Public service vehicles (PSVs) in the South Rift Valley, Kenya, present a unique and concerning environment for potential pulmonary tuberculosis (PTB) transmission. The confined spaces, often characterized by poor ventilation and close passenger proximity, create conditions conducive to airborne spread. Recognizing the crucial role PSV operators play in mitigating this risk, this study aimed to evaluate the baseline knowledge of PTB prevention and control measures among PSV operators in the South Rift Valley, Kenya.

Descriptive cross-sectional study was conducted, employing systematic sampling to recruit 120 drivers and 80 conductors in Kericho county and Bomet county. Data was collected using a pre-tested, interviewer-administered, semi-structured questionnaire. Adequate knowledge was defined as correctly answering ≥50% of knowledge-based questions. Statistical analysis was performed using SPSS version 22 and included chi-square ($\chi 2$) tests to assess associations, with statistical significance set at $p<0.05$.

Ethical approval was obtained, and informed consent was secured from all participants. The mean age (±SD) was 35.4 (±5.5) years for drivers and 26.7 (±4.8) years for conductors. The majority (86%, n=172) of participants had attained secondary education.

Overall, 68% demonstrated adequate PTB knowledge. Drivers exhibited significantly higher knowledge levels compared to conductors ($\chi 2 = 6.25$, $p = 0.012$). Education level was significantly associated with knowledge ($\chi 2 = 12.8$, $p = 0.001$).

Notably, half (50%, n=40) of conductors demonstrated adequate PTB knowledge. A significant proportion (87.5%, n=49) of those with primary level education demonstrated inadequate PTB knowledge. While overall PTB knowledge was moderate, a statistically significant knowledge gap exists among conductors, indicating a critical vulnerability within this population.

Considering the high PTB burden in Kenya (WHO, 2023) and the inherent transmission risks within PSVs (Ministry of Transport, Kenya, 2022), targeted interventions are essential to improve knowledge and control PTB transmission. This study underscores the urgent need to protect public health.

TBS-EP617 Analysis of mixed-strain Mycobacterium tuberculosis infections reveals lineage- and clinical-specific patterns

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Persisting tuberculosis (TB), especially drug-resistant forms, remains a global health challenge. Mixed-strain infections (MSIs), in which drug-sensitive and drug-resistant Mycobacterium tuberculosis clones co-exist, can undermine diagnostics, impede therapy, and drive chronic or latent disease.

Leveraging the TB Portals multi-domain database—linking full-genome sequencing of 9 667 isolates from Eastern Europe and Central Asia to patient-centric clinical, socioeconomic, and radiological data—we applied QuantTB to identify 521 MSIs (5.4 %): 481 two-strain, 39 three-strain, and one four-strain events.

MSIs were underrepresented among newly diagnosed cases yet enriched in patients with relapse, treatment failure, or chronic TB definitions. Clinically, MSIs showed higher sputum smear grades (≥ 2+), a male predominance, and elevated rates of treatment failure and loss to follow-up; in Outcomes, cure and mortality rates matched expectations. Resistance profiles revealed over-representation of MDR and XDR TB and under-representation of fully drug-sensitive infections.

Two-strain MSIs were driven by Lineage 2 (Beijing) and key Euro-American subclades, while three-strain events comprised almost exclusively Lineage 4.3 (Latin American–Mediterranean) and 4.1 (Haarlem), reflecting their high intra-sublineage diversity and balanced within-host fitness. Beijing strains, by contrast, frequently outgrow minor partners.

Although MSIs are a minority of sequenced cases, they disproportionately correlate with high bacillary burdens, drug resistance, and adverse outcomes. These lineage-specific co-infection dynamics underscore the need for lineage-aware surveillance, enhanced mixed-strain detection, and tailored treatment strategies—particularly for patients with relapse or treatment failure—to prevent amplification and transmission of complex MSIs in high-burden settings.

TBS-EP618 Is transmission the primary route to bedaquiline resistance? A context specific framework for transmission threshold estimation

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Infection with Mycobacterium tuberculosis strains that are resistant to bedaquiline (BDQ) threaten TB control. Such resistant infections can arise in three ways: spontaneous emergence without any drug exposure, acquisition during treatment or transmission. To determine interventions for control, it is vital to estimate the relative contribution of each of these three mechanisms to resistance burden. While it is likely that eventually the majority of BDQ resistant (BDQR) infections will be due to transmission, as is the case for MDR-TB, determining the point at which the predominant mechanism switches from spontaneous emergence and acquisition to transmission is vital to informing intervention policy.

To estimate the contributions of each mechanism, we developed a novel static threshold model which asks whether spontaneous mutation and acquisition alone can explain the current prevalence of BDQR in MDR/RR-TB patients. The model establishes a threshold above which transmission must be invoked to explain the observed BDQR prevalence. The model incorporates prior treatment levels and uncertainty in acquisition and mutation rate estimates.

Preliminary analysis suggests that transmission may become the dominant mechanism once BDQ is being used to treat more than 50% of MDR/RR-TB patients and BDQR prevalence in MDR/RR-TB is above 2.15%. From the limited prevalence data available from South Africa and Mozambique, it seems transmission may already be the dominant mechanism in both countries. Our Mozambique analysis shows that in early BDQ rollout, it can appear that the contribution of transmission reduces, but this is due to the increased contribution of the acquisition mechanism.

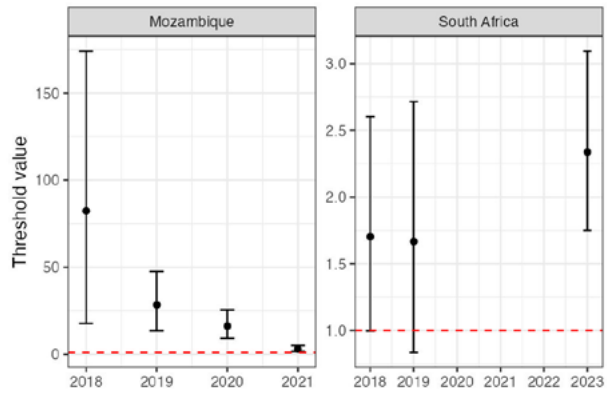

Figure 1: Threshold values by year in Mozambique and South Africa. Points are mean estimates; errorbars are 95% CIs. Threshold values >1 (red, dashed line) indicate transmission. Note, axes differ.

Our threshold analysis may enable new insights into BDQR spread whilst also providing a framework for context specific analysis. Preliminary modelling suggests that even at low resistance prevalence levels in MDR/RR-TB, BDQR is mostly transmitted, highlighting the need for early diagnosis, high coverage of BDQ drug susceptibility testing and effective BDQR treatment.

TBS-EP620 Utility of antibody responses in the diagnosis of tuberculosis in rural Papua New Guinea

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Background: TB is endemic in Papua New Guinea (PNG) and diagnosis is challenging, due to limited access to healthcare resources. Recent studies suggest that *Mycobacterium tuberculosis* (Mtb) antibodies may have diag-

nostic utility. The objectives of this study were:
1. To determine whether Mtb antibody levels differ between interferon gamma (IFN-γ) release assay (IGRA) positive and negative individuals;
2. To investigate whether Mtb antibodies are useful biomarkers to differentiate TB disease states.
Methods: Plasma was collected from adult participants at the Balimo District Hospital, Balimo, PNG. Initially, participants with known IGRA status were divided into IGRA+ and IGRA- groups. ESAT6- and CFP10-specific isotype, subclass and Fc gamma receptor (FcγR) binding antibodies were measured using bead-based multiplex assays.
The study cohort was also divided by TB disease state into TB negative, laboratory confirmed TB, clinical TB, and LTBI groups and plasma were tested for antibody isotype, subclass and FcγR binding to Mtb antigens ESAT6, CFP10, PstS1, HspX, MPT32, MPT64 and Ag85B.
Results and Conclusions: There was no significant difference in anti-ESAT6 or anti-CFP10 antibodies between IGRA+ and IGRA- individuals for any isotype, subclass, or FcγR binding. A weak positive correlation between anti-CFP10 IgG1 and IFN-γ release was the only significant correlation between Mtb-specific humoral and cellular immunity.
Across the TB groups, anti-PstS1 total IgG, anti-PstS1 IgG1 and anti-MPT32 IgG1 were elevated in the laboratory confirmed TB group compared to the TB negative group. Interestingly, anti-HspX IgA1 was elevated in the clinical TB group, but not the laboratory confirmed TB group, relative to the TB negative group.
There were no significant differences in Mtb-specific antibody levels across the three TB disease states and high intragroup variability was observed across all groups including the TB negative group. These findings underscore the necessity for further research on Mtb-specific antibody responses in TB-endemic communities.

TBS-EP622 Evaluation of the consistency between phenotypic MIC and genomic mutations in the detection of Bedaquiline and Clofazimine cross-resistance in *Mycobacterium tuberculosis* isolates from the Philippines

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Background: Bedaquiline (BDQ) and Clofazimine (CFZ) are increasingly chosen for drug-resistant tuberculosis (TB) treatment. However, given their critical therapeutic roles, cross-resistance between these drugs have emerged as major concerns. As BDQ and/or CFZ-containing regimens increase, is important to support clinical decision with an improved genetic BDQ resistance information.
Purpose: This study was aimed to phenotypically and genotypically assess BDQ and CFZ resistance in *Mycobacterium tuberculosis* (MTB) isolates from DR-TB patients in the Philippines.
Methods: DR-TB clinical isolates (n=188) were isolated from 188 Philippines' patients. MIC for MTB was established in accordance with the guidelines by the CLSI M24-A2. Drug resistance mutations related to BDQ and repurposed CFZ were detected using the online tool TB Profiler, which could also report lineage information about the strains.
Results: Only 5 (2.7 %) isolate was resistant to BDQ, based on the CLSI breakpoint of 0.5 μg/mL. The three isolates with MIC at 1 to BDQ were all resistant to CFZ; these isolates' MIC with 4. Out of three cross-resistant between BDQ and CFZ isolates, only one isolate had mutation in mmpR5_c.198dupG, and was identified as lineage 1.
Discussion and Conclusion: Our study found that only one BDQ-resistant isolates had duplication mutations in *Rv0678*, however, other four isolates were resistant to BDQ (MIC range from 0.5 to 1) harboured no mutation in all known resistance-associated genes. This demonstrated that the mutation of Rv0678 has low specificity in predicting BDQ and/or CFZ resistance.
Although previous reports indicate that the duplication mutation at base pair 198 of *Rv0678* is rare, our results suggest that isolates harboring this mutation may reflect the level of protein inactivation. The reasons for the differences between the phenotypic and genomic resistance of our study could be due to missed low-frequency resistance mutations, mutations in novel resistance genes, or erroneous phenotypic DST results.

TBS-EP624 Gastrointestinal parasites and their association with TB immune responses in Rural Papua New Guinea

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Background: Tuberculosis remains a major public health threat in Papua New Guinea (PNG), particularly in remote and resource-limited regions such as Balimo, Western Province. The burden of TB in PNG is compounded by the high prevalence of parasitic infections, including soil-transmitted helminths (STH) and intestinal protozoa, which are known to modulate host immune responses. Although substantial evidence suggests that parasitic co-infections can influence immunity to *Mycobacterium tuberculosis* (Mtb), the extent to which these interactions impact TB pathogenesis and clinical outcomes remains unclear and context dependent.
This study aimed to investigate the immunological effects of co-endemic parasitic infections in a TB-endemic community.
Methods: Blood, sputum, and stool samples, along with demographic and clinical information, were collected from participants categorized into three groups: individuals with active pulmonary TB, those with latent TB infection, and TB-naïve community members. Stool analysis identified individuals with confirmed STH or protozoan infections, including both pathogenic and commensal species. Peripheral blood samples were analysed for innate and adaptive immune markers, including T cell subsets and cytokine profiles. TB-specific immune responses were further evaluated using interferon gamma release assays (IGRA) and the TAM-TB flow cytometry assay.
Results: Our results revealed a high prevalence of CCR3+ eosinophils in individuals with active STH infections and those seropositive for *Strongyloides stercoralis*, indicating ongoing immune modulation.
Additionally, many community members exhibited impaired CD4+ and CD8+ T cell function, which could compromise protective immunity against Mtb, potentially leading to increased TB susceptibility, diagnostic delays, and poorer treatment outcomes.
Conclusions: These findings emphasise the need for integrated disease control strategies that address co-infections and their immunological consequences. A better understanding of parasite–TB interactions is essential for optimizing TB vaccination, diagnostics, and treatment approaches, particularly in co-endemic settings.
This study underscores the importance of interdisciplinary research linking infectious disease ecology, immunology, and public health policy.

TBS-EP626 Accelerating tuberculosis prevention: Assessing novel TB preventive treatments in a preclinical infection model

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Tuberculosis (TB) caused over 1.25 million deaths globally in 2023. Following infection with *Mycobacterium tuberculosis* (M.tb), active disease can develop in up to 20% of infected patients, often after several months or years following infection. During this period, treatments can be administered to limit disease progression, known as tuberculosis preventive therapy (TPT). However, current TPTs are lengthy (up to 9 months) and can produce serious side effects due to anti-TB drug toxicity, leading to limited administration among infected individuals. Therefore, we need effective therapeutic options with fewer side effects and shorter durations.
Large-scale clinical trials evaluating TPT efficacy are costly and time-consuming. To streamline the development of new TPTs, we established a murine model of M.tb infection to evaluate short-course treatments (≤2 months) with minimal toxicity and relapse rates comparable to the standard 4-month rifampicin regimen (4R10), as part of the SSTaRLeT adaptive clinical trial.
We validated the model by comparing 4R10 with a 2-month high-dose rifampicin regimen (2R20). At 2 months post-treatment with R20, only 1 of 5 mice had detectable lung bacteria.
We also assessed relapse rates following treatment durations of 4, 6, and 8 weeks with 2R20, finding outcomes similar to 4R10 following 2 months of treatment with R20 (40% vs. 47% relapse for 4R10 and 2R20, respectively), supporting the potential of shorter regimens.
We also evaluated the efficacy and optimal duration of the HP regimen (daily administration of isoniazid and rifapentine) and a novel LvP regimen (daily administration of levofloxacin and rifapentine). Levofloxacin offers a favourable toxicity profile and potential efficacy against drug-resistant strains.

To further refine these two TPTs, we are conducting pharmacokinetic steady-state studies to optimize the dosing of both regimens. This model enables rational preclinical testing of TPT, avoiding arbitrary drug repurposing and accelerating the path toward effective, shorter-duration regimens.

TBS-EP628 The computer-aided detection software using chest X-ray images in TB screening may have the potential to identify early TB patients in China

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Pulmonary tuberculosis (PTB) remains a global public health challenge, with 10.8 million new cases reported in 2023. Early diagnosis is crucial for controlling its spread, yet traditional sputum-based tests face limitations in turnaround time and resource availability. Artificial intelligence (AI)-based computer-aided detection (CAD) systems, leveraging deep learning, offer a promising solution for automated PTB detection. In a latest meta-analysis including five software solutions for chest X-ray has shown sensitivity and specificity as follows: JF CXR-1, 86.0% and 80.0%; qXR, 90.0% and 64.0%; Lunit INSIGHT CXR, 90.0% and 63.0%; CAD4TB, 91.0% and 60.0%; InferRead DR Chest, 89.0% and 59.0%, of which JF CXR-1 and InferRead DR Chest are from China.
Another interesting research focusing on aged ≥65 years old in Jiangshan County, Quzhou City, China also used JF CXR-1 v2 for detecting chest X-ray images and to estimate its potential capacity for identifying PTB cases. A total of 49,919 subjects participated in the 2020 examinations. Of these, 40,741 and 39,185 completed the follow-up surveys in 2021 and 2022, respectively. The pooled prevalence of suspected PTB reported by radiologists was 1.21% (1579/129,776), compared with 12.43% (16,129/129,776) reported by CAD. Of 101 bacteriologically confirmed PTB cases notified over three years, radiologists and CAD reported 45.54% (46/101) and 83.16% (84/101) as suspected cases, respectively. Among subjects with abnormal CAD (CAD score>0.35), the majority of the notified confirmed PTB patients (63/84) had their CAD scores >75% quantiles (as>0.75). With 3 years` results, their CAD scores exhibited dynamic changes along with disease progression or treatment with median scores peaking in the year of diagnosis. This intriguing finding suggests that CAD for CXR reading assisted radiologists in PTB screening by reducing workload and improving case finding. The CAD primary score may have the potential to identify high-risk individuals and early PTB patients.

TBS-EP630 Comparing LAM to other sputum-based biomarkers in NC-009 trial

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New mycobacterial markers are needed to shorten and improve outcome predictability of TB drug trials, which still rely on sputum culture, a resource-intensive procedure with results taking up to 8 weeks. PATHFAST TB LAM Ag assay (LAM), a semi-automated chemiluminescent enzyme immunoassay that quantifies mycobacterial lipoarabinomannan in sputum within 1 hour, appears as a promising alternative, but has been only evaluated in patients treated for up to 2 weeks.
We compared LAM with other sputum-based biomarkers, namely acid-fast bacilli smear microscopy (AFB), Xpert threshold cycle (Ct) and MGIT time-to-positivity (TTP) in NC-009, an ongoing randomized, controlled, phase 2 study evaluating 3 doses of the next-generation diarylquinoline TBAJ-876 in combination with pretomanid and linezolid (876PaL) for 8 weeks, followed by isoniazid-rifampicin for 15- and 26-week total treatment durations.
Comparator arms are 26-week BPaL and standard-of-care HRZE/HR. LAM, AFB, Ct and TTP levels were obtained from 2 sputum samples at baseline and during treatment (day 15, and weeks 4, 8, 15 and 26), as well as in select recurrence cases, for a subcohort of 159 South African participants.
All assays were performed using the same starting material, decontaminated sputum samples. LAM was quantified in a PATHFAST instrument; AFB, Ct and TTP levels were derived using standard procedures. Quantitative readouts for LAM, Ct and TTP, and semi-quantitative AFB were used to determine the dynamics of each test throughout drug treatment and in pairwise correlation analyses.
LAM performance (sensitivity/specificity/negative predictive value/positive predictive value) was assessed by classifying sputum samples into negative (below cutoff) versus positive and using MGIT as a reference. LAM results at each visit were also examined as predictors of stable culture conversion. In general, LAM data paralleled TTP data beyond 2 weeks of treatment.

TBS-EP632 Low complexity-manual nucleic acid amplification tests for detection of pulmonary tuberculosis in adolescents and adults with presumptive tuberculosis: A systematic-review and meta-analysis of diagnostic accuracy

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Background: Early detection and treatment of tuberculosis (TB) is crucial for global TB elimination. LC-mNAATs such as TB-LAMP (loop-mediated isothermal amplification) are World Health Organization (WHO) recommended rapid diagnostics (mWRDs) shown to have comparable performance to low complexity automated NAATs for pulmonary TB. Our review aimed to synthesize evidence for LC-mNAATs for detection of pulmonary TB (PTB) to inform an update of the 2024 WHO consolidated guideline on diagnosis of TB.
Design/Methods: We searched CENTRAL, MEDLINE, EMBASE and other electronic databases using specific search terms. We also performed hand searches and bibliography mining. A WHO public call for data contributed additional studies. We included studies that evaluated design locked marketed LC-mNAATs against microbiological or composite reference standards in adolescents and adults (>10 years) with presumptive PTB. We independently in pairs screened titles/abstracts and full texts, extracted data, and performed quality assessment of included studies. Certainty of evidence was assessed using the GRADE approach.
Results: We screened 1138 titles and abstracts and included 27 studies from 151 full texts. The studies generally had low risk of bias and applicability concern (Figure 1A). From 26 studies (18297 participants, Figure 1B), summary sensitivity (95% CI) and specificity (95% CI) on respiratory specimens for detection of PTB were 84.1% (78.3 to 88.6) and 96.1% (94.2 to 97.4), high certainty of evidence. Among PLHIV, summary sensitivity was 77.1% (60.8 to 87.9) and summary specificity was 95.9% (84.9 to 99.0) (8 studies, 2991 participants). Summary sensitivity and specificity were 95.9% (92.2 to 97.9) and 43.7% (26.8 to 62.2) among smear positive individuals (16 studies, 1568 participants).
Conclusion: TB-LAMP has satisfactory performance for detecting PTB in adolescents and adults. Though the inability to detect rifampicin resistance is a limitation, TB-LAMP could be a potential alternative for smear microscopy and other mWRDs that necessitate complex infrastructure.

Figure 1A. Risk of bias and applicability summary. **Figure 1B.** Forest plot of LC-mNAATs for detection of PTB: respiratory specimens and microbiological reference standard.

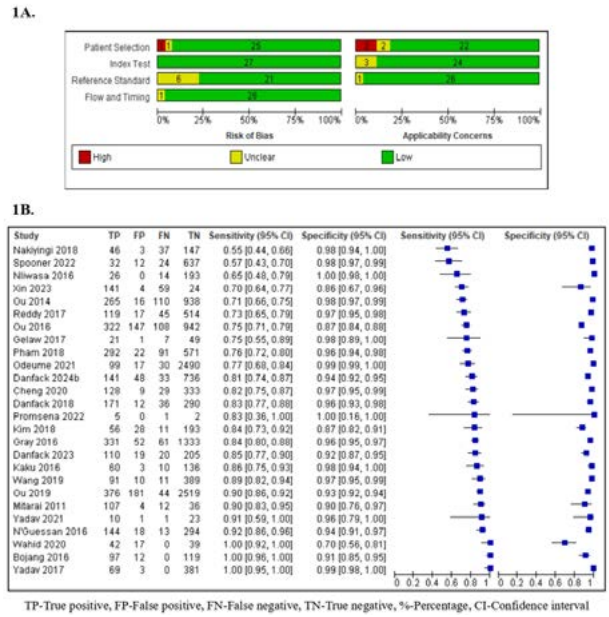

Figure 1A. Risk of bias and applicability summary. Figure 1B. Forest plot of LC-mNAATs for detection of PTB: respiratory specimens and microbiological reference standard.

TBS-EP634 Impact of TB preventive therapy at grassroots level in community setting in Pune, India

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Background: Tuberculosis (TB) remains a significant public health issue in India. Preventing TB among high-risk populations, particularly household contacts (HHCs) of TB patients, is essential to achieving elimination goals. This study evaluates the impact of community-based TB Preventive Therapy (TPT) implementation through active contact tracing, regular follow-up, and upfront molecular testing.
Methods: A total of 310 TB index cases were notified over one year. Contact tracing was conducted for all, identifying 834 household contacts. Among them, 821 (98%) were screened for TB symptoms across multiple visits. 23 symptomatic individuals were identified and 22 tested using NAAT, resulting in the diagnosis of 2 active TB cases. Asymptomatic and eligible contacts were initiated on a 3HP TPT regimen. Follow-up was conducted for one year to assess treatment completion and TB incidence.

Results: The implementation outcomes are summarized below:

Sr. No.	Indicator	Value
1	TB Index Cases	310
2	Household Contacts Traced	834
3	Contacts Screened for Symptoms	821 (98%)
4	Symptomatic Contacts Identified	23
5	TB Cases Diagnosed After NAAT	2
6	Contacts Started on TPT (3HP)	466 (99.8%)
7	TPT Completion (Among Initiated)	451 (96.8%)
8	TB Cases After TPT Completion (1-Year)	3

Conclusion: The high rate of screening, treatment initiation, and completion demonstrates that TPT delivery at the grassroots level is highly feasible and impactful. The very low incidence of TB among those who completed TPT highlights its effectiveness in preventing disease. This model can serve as a scalable strategy to support TB elimination efforts across similar community settings.

TBS-EP636 Innovative AI tool for TB diagnosis based on metabolomic detection in urine

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Tuberculosis (TB) persists as a global threat for public health and remains one of the most threatening and underdiagnosed curable infectious diseases. Current diagnostic methods present limitations, and there is an urgent need to develop a rapid, accurate and accessible diagnostic tool to improve TB control and reduce disease burden. We present an innovative solution based on urinary metabolomic detection powered by artificial intelligence (AI) and benchtop nuclear magnetic resonance (NMR) spectroscopy.

Previous clinical evidence within our research group showed significant changes in the concentration of eight metabolites in the urine of TB patients compared to healthy individuals.

In 1H NMR spectroscopy, every metabolite produces a unique pattern of peaks resulting from oscillations of its hydrogen nuclei in a magnetic field. The concentration of each metabolite is directly proportional to the area of its peaks. The complexity of NMR spectra lies in several factors: variations in peak width, positional shifting of peak clusters due to pH variability in urine the sample, white noise, and contamination of the sample.

Neural network (NN) models play a big role in analyzing complex NMR spectra and accurately quantifying metabolite concentrations. NNs were trained with thousands of synthetized NMR spectra to address the lack of training samples. The simulations included all features listed above to accurately replicate real cases.

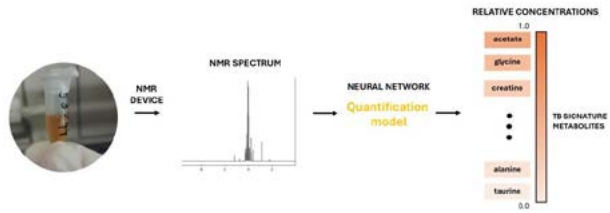

Figure 1.

NNs are later fine-tuned with real annotated NMR spectra. The models are able to capture subtle NMR information that traditional techniques fail to identify. Our test *(Figure 1)* allows an automatic and quick identification and quantification of dominant metabolites within urine samples that will subsequently provide accurate TB diagnosis. Clinical studies performed in Europe, Haiti and Nigeria have proved the metabolomic signature to be a global diagnostic method and will increase the NN models' robustness across different clinical settings.

TBS-EP641 Detection of LAM in exhaled breath condensate for tuberculosis diagnosis and treatment monitoring using different immunoassays

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Exhaled breath condensate (EBC), the liquid phase of the exhaled air sampled by cooling, appears as a promising sample to facilitate clinical diagnosis of TB across patient populations and monitor treatment efficacy. Yet, its relevance and usefulness in the management of TB has to be validated in large cohorts. We previously reported that Lipoarabinomannan (LAM), a mycobacterial cell envelope lipoglycan and established TB biomarker in urine, was present in large amount in EBC from TB patients collected in the frame of a pilot study in Colombia (PMID: 36517492).

We took advantage of the SMA-TB EU-funded project (GA847762) Phase II clinical trial (NCT04575519), conducted to evaluate ibuprofen and acetylsalicylic acid as anti-inflammatory adjunctive to anti-tuberculosis treat-

ment, to nest a clinical study and collect EBC samples from the enrolled patients. Samples were collected at baseline (from n=217 patients) and along the course of treatment (from n=86 patients; 5 time-points). In addition, as this sample is known to show important inter- and intra-subject variability, samples were collected at 4 different times of the same day for a limited number of patients. Here, we report the quantification of LAM in EBC samples collected in the frame of SMA-TB in South Africa and Georgia, using 3 different techniques based on an immunoassay: a home-made laboratory Dot-Blot, a lateral flow test from LIONEX GmbH, and the PATH-FAST™ analyzer.

TBS-EP644 Treatment outcomes of tuberculosis among artisanal and small-scale miners in Zimbabwe: A follow-up observational study using secondary data

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In Zimbabwe, artisanal and small-scale miners (ASMs) are a key vulnerable group with high risk for tuberculosis (TB), HIV, and silicosis. The main purpose of this study was to investigate treatment outcomes of TB among ASMs. We conducted a follow-up observational study using secondary data. We analyzed data from 208 ASMs treated for TB at two occupational health clinics. We found a high treatment success rate of 87%, comparable to the national average for drug-sensitive TB. Unsuccessful outcomes were due to death (5%) and loss to follow-up (7%). Over a quarter of ASMs had unknown HIV status. Our study is the first to document treatment outcomes of TB among ASMs in Zimbabwe. Encouragingly, this study demonstrates the possibility of achieving good TB treatment outcomes even among highly mobile populations like ASMs. Further research is needed to analyze leakages across the whole TB patient pathway among ASMs. Additionally, addressing the high rate of unknown HIV statuses among ASMs is crucial to further improve overall TB treatment outcomes in this population.

TBS-EP647 Enhancing lung health through physiotherapy for overall well-being

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Background: Lung health is essential for overall well-being, yet respiratory conditions such as tuberculosis, chronic obstructive pulmonary disease (COPD), asthma, and post-COVID-19 complications continue to affect millions worldwide. Physiotherapy has emerged as a vital intervention in improving pulmonary function, reducing respiratory distress, and enhancing quality of life.
This study explores the role of physiotherapy in promoting lung health and its impact on overall well-being.
Methods: A systematic review of existing literature and clinical studies was conducted to evaluate the effectiveness of physiotherapy techniques, including breathing exercises, airway clearance techniques, pulmonary rehabilitation, and physical conditioning. Data from patient records, clinical trials, and meta-analyses were analyzed to assess improvements in lung function, oxygen saturation levels, and patient-reported outcomes.
Statistical analysis was performed using a random-effects model to assess mean differences in lung function parameters such as forced expiratory volume (FEV1), peak expiratory flow rate (PEFR), and oxygen saturation. A significance level of $p < 0.05$ was used to determine statistical relevance.
Results: The findings indicate that physiotherapy interventions significantly improve pulmonary function parameters, with a mean increase in FEV1 by 12% ($p = 0.002$) and PEFR by 15% ($p = 0.004$), enhance exercise tolerance, and reduce respiratory symptoms in chronic lung conditions patients. Patients who underwent structured physiotherapy programs reported better lung capacity, improved oxygen exchange levels ($p = 0.007$), and reduced episodes of breathlessness. physiotherapy contributed to overall well-being by improving mobility, reducing fatigue, and enhancing mental health.
Conclusion: Physiotherapy is a crucial component in lung health management, offering non-invasive and effective interventions for patients. Introducing physiotherapy into standard care could lead improved respiratory function, increased physical activity, and better quality of life. Future research should focus on optimizing physiotherapy protocols and expanding access to pulmonary rehabilitation programs.

TBS-EP650 Rational use of antibiotics and antimicrobial resistance in pulmonary infections

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Antimicrobial resistance (AMR) is a major global health threat, despite the annual increase in newly developed antibacterial agents. The WHO Global Strategy for Containment of Antimicrobial Resistance emphasizes the need to preserve the effectiveness of essential medicines such as antibiotics for current and future generation. Resistance in microorganisms leads to prolonged hospital stays, increased healthcare costs, and higher mortality rates. This study aimed to assess the prevalence, structure, and rational use of antibiotics in patients with respiratory tract diseases in Turkmenistan.

Medical records of 269 patients with upper and lower non-specific respiratory infections were reviewed. Most patients were aged 41–60 years (68.5%), and 51.3% were female. Clinical diagnoses included community-acquired pneumonia (47.3%), chronic obstructive pulmonary disease (18.2%), and chronic bronchitis (34.5%).

Bacteriological examination showed Staphylococcus aureus in 28.6%, Streptococcus spp. in 15.2%, Pseudomonas aeruginosa in 4.8%, Streptococcus pneumoniae in 25.1%, mixed flora in 20.0%, and Candida spp. in 6.3%. Cephalosporins (39.8%) were the most prescribed antibiotics, followed by fluoroquinolones (17.8%), penicillins (13.4%), aminoglycosides (13.0%), tetracyclines (5.6%), macrolides (4.1%), antifungals (4.8%), and carbapenems (1.5%). Antimicrobial resistance was detected in 61.3% of patients. The most frequent resistances were to cephalosporins (35.2%), penicillins (21.6%), aminoglycosides (12.0%), macrolides (8.0%), fluoroquinolones (7.8%), tetracyclines (5.6%), carbapenems (3.4%), antifungals (1.8%), and sulfonamides (4.6%).

Contributing factors to AMR included empirical antibiotic prescribing without microbiological testing, short treatment durations, and premature discontinuation of therapy. Effective AMR prevention strategies must include stewardship programs, guideline-based prescribing, and increased awareness among healthcare providers.

TBS-EP653 Tissue-specific immune phenotyping reveals divergent responses to BCG vaccination and *Mycobacterium tuberculosis* challenge

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Aim: To identify tissue-residency profiles playing a relevant role in *Mycobacterium tuberculosis* (*Mtb*) immunity in a mouse model of tuberculosis (TB): in the absence of vaccination, after naïve BCG-vaccination, or with a vaccination strategy based on the exposure of naïve BCG to human alveolar lining fluid (ALF-BCG) to evaluate the influence of the lung environment on immune responses.
Methods: C57BL/6 mice were infected by aerosolization (Glas-Col chamber) with *Mtb* $H_{37}R_v$. Infected mice were divided into 3 groups: unvaccinated, naïve BCG or ALF-BCG-vaccinated. Mice received subcutaneous vaccination 4 weeks prior infection; and sacrificed 6 weeks post-infection. At necropsy, blood and lungs were extracted, and cells were obtained after erythrocyte lysis and Percoll density-gradient centrifugation, respectively. Cells were stimulated overnight with specific mycobacteria antigens (ESAT-6/CFP-10 or PPD) and stained for surface and intracellular markers specific to T-, B- and NK-cells. Samples were acquired using Cytek Aurora and analysed with OMIQ for unsupervised high-dimensional analyses.
Results: Tissue-resident memory CD4 and CD8 T-cells ($CD69^+CD103^+$) were enriched in the parenchyma of unvaccinated infected mice. Naïve BCG-vaccination resulted in several changes in lung and blood immune cell populations: (i) lung exhibited a terminally differentiated CD8 T-cell response ($KLRG\text{-}1^+CX3CR1^+$) with decreased IL-17a and increased activated B-cells ($CD44^+$I-A/I-$E^+CD1d^+CD69^+$); while (ii) the blood showed a shift towards pro-inflammatory CD4/CD8 Th17 responses and mature $CD11b^+CD27^-$ NK-cells (expressing $CD44^+KLRG1^+CD62\text{-}L^+$). ALF-BCG-vaccination enhanced certain naïve BCG-driven immune responses, mainly the abundance of activated B-cell clusters in lung, and specific memory T-cells in blood.

Conclusions: Following *Mtb* infection, lung immune cells display specific tissue-residency phenotypes. Moreover, immune mechanisms driven by BCG have diverse local and systemic effects, being cell profiles remarkably different depending on the tissue of origin. ALF-BCG-vaccination drove enhanced specific B and T-cell immune subsets *vs.* naïve BCG.

TBS-EP656 Risk of human tuberculosis associated with exposure to livestock in rural Ballabgarh, Haryana: A Case-Control Study

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Background: There is very limited data on contribution of zoonotic TB in overall burden of tuberculosis in India. This study was conducted to estimate the risk of tuberculosis among individuals exposed to livestock in rural Ballabgarh, Haryana.
Methods: An unmatched case control study was conducted between October 2022- March 2023 in a rural area of the Ballabgarh block in Haryana, India. Patients of all ages and sexes with microbiologically confirmed tuberculosis were enrolled as cases. Outpatient attendees of the facilities in the study area who resided in the same area as cases and among whom tuberculosis was ruled out by chest x-ray, and sputum examination by smear microscopy and molecular methods were enrolled as controls. Case to control ratio was 1:3. Information on demographics, livestock ownership and exposure to cattle and raw milk consumption were elicited through structured questionnaire. The livestock at the case and control household were screened using Interferon Gamma Release Assay (IGRA) test. Multivariable logistic regression was done to assess the association between exposure and tuberculosis.
Results: 65 cases and 205 controls were enrolled in the study. The mean age of cases was 39.9 years (SD-18.3) and that of controls was 41.3 years (SD-14.4). 26 (41.3%) of the household with cases and 89 (43.4%) of the household with controls had livestock. 18% (39/219) of the livestock were positive by IGRA; 20% (31/157) buffalos, 11.8% (6/51) cattle and 18.1% (2/11) goats. Contact with livestock (aOR- 0.6; 95% CI- 0.3-1.2) and consumption of raw milk (aOR-0.5;95% CI- 0.2-1.4) were not associated with risk of tuberculosis. There was no increased risk of bovine tuberculosis among livestock in households with cases as compared to controls (cOR for buffalo- 0.95, 95% CI- 0.41-2.20; cOR for cattle: 0.74, 95% CI- 0.12-4.50)
Conclusion: Exposure to livestock was not associated with increased risk of tuberculosis.

Exposures	Case (n=63) n (%)	Control (n=205) n (%)	Crude Odds ratio (95% CI)	Adjusted Odds (95% CI)	P value
Age (Years)					
<=40	32 (50.8)	109 (53.2)	Ref		
=>41	31 (49.2)	96 (46.8)	1.1 (0.6-1.9)	1.1 (0.6-2.0)	0.723
Sex (Male)	54 (66.7)	85 (41.5)	2.8 (1.6-5.1)	3.1 (1.7-5.7)	0.000
Owning livestock	26 (41.3)	89 (43.4)	0.9 (0.5-1.6)	-	
Owning cattle (cow/bull)	10 (15.9)	39 (19.2)	0.8 (0.4 -1.7)	-	
Owning buffalo	19 (30.2)	66 (32.2)	0.9 (0.5-1.7)		
Owning goats & sheep	1 (1.6)	5 (2.4)	0.6 (0.1-5.6)	-	
Contact with livestock	15 (23.8)	75 (36.6)	0.5 (0.3-1.0)	0.6 (0.3-1.2)	0.157
Consumption of raw milk	5 (7.9)	26 (12.7)	0.6 (0.2-1.6)	0.5 (0.2-1.4)	0.176

TBS-EP659 Navigating funding challenges to end tuberculosis in Bangladesh: A call for sustained commitment and domestic investment

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Tuberculosis (TB) remains a persistent public health challenge in Bangladesh, with an estimated 379,000 cases reported in 2023—reflecting a 7.4% increase from 2015 and a modest 1.1% rise from 2022. Despite the disease being preventable and curable, Bangladesh continues to face significant hurdles, especially with the growing threat of multidrug-resistant TB (MDR-TB), which poses both a health and security risk. Systemic challenges—including inadequate funding, limited domestic financial commitment, and uneven access to quality diagnostic and treatment services—have hampered TB control efforts.
These challenges have been exacerbated by the global funding crisis triggered by the U.S. STOP order on January 27, 2025, which led to major funding withdrawals by international donors, severely impacting TB programs worldwide, including Bangladesh.
Bangladesh's National TB Control Program has demonstrated consistent efforts in scaling up TB detection and treatment, contributing to the global success of saving an

estimated 79 million lives since 2000. In 2023, the country secured US$ 92 million for TB programming—an improvement in domestic contribution to 38% compared to 3.7% in 2015. However, the national TB budget stood at US$ 365 million in 2023, with a staggering 81% unfunded. This critical gap threatens the sustainability of existing interventions and the ability to scale up essential services, particularly for MDR-TB.

While the TB incidence appears stable, the progress is fragile. The increasing share of domestic funding signals progress, yet it remains insufficient to meet the growing programmatic needs. The reliance on unpredictable external funding underscores the vulnerability of TB responses in Bangladesh.

To achieve the 2030 TB elimination target under the Sustainable Development Goals, Bangladesh must prioritize increased domestic resource mobilization, integrate TB services within primary healthcare, and ensure sustained policy and financial commitments. Strengthening health systems and investing in MDR-TB prevention and treatment are vital to maintaining progress.

TBS-EP662 Density-dependent enhancement of *Mycobacterium tuberculosis* growth by culture filtrate

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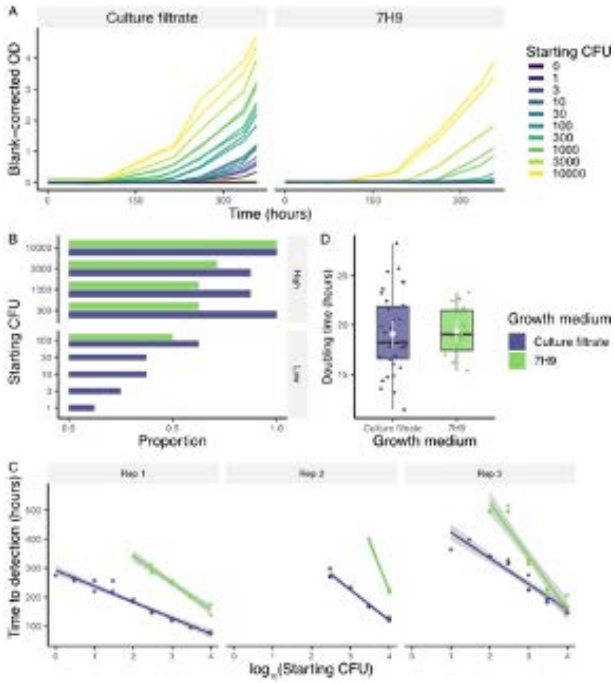
The culturing of *Mycobacterium tuberculosis* (*Mtb*) remains a critical research and diagnostic tool. However, growing *Mtb* from paucibacillary inocula, particularly clinical samples, is challenging. Culture filtrate (CF) supplementation of standard growth media (7H9) has been proposed to enhance *Mtb* culturability by restoring growth in a subpopulation known as differentially culturable tubercule bacilli (DCTB). While efforts have been made to identify the active components of CF, limited data describe how CF supplementation influences culturability from extremely low-density inocula.

We performed a half-logarithmic (~3.16-fold) dilution series of *Mtb* H37Ra from 10,000–0 CFU, culturing each inoculum in either 7H9 or CF. Growth was monitored using optical density measurements, and growth outcomes (growth/no-growth), time to detection (TTD), and maximal growth rate were calculated for each sample.

Inocula of ≥300 CFU were 33 times more likely to grow compared to inocula of ≤100 CFU, accounting for growth media. CF supplementation increased the odds of growth fivefold and reduced the TTD by an average of 294 hours compared to 7H9, without affecting the maximal growth rate. However, this effect was not consistent at all inoculum densities. The difference in TTD between CF and 7H9 reduced by 58 hours for every $\log_{10}$-increase in inoculum density, becoming negligible at ~60,000 CFU/mL.



While CF enhanced the probability of *Mtb* growth, this effect was most pronounced at low inoculum densities. Given the proposition that DCTB comprise a subset of the population that would have been diluted out in these low-density samples, and considering the inverse relationship between CF efficacy and inoculum density, we propose that CF promotes growth only in low-density inocula, rather than by specifically resuscitating DCTB. These findings suggest that other mechanisms, such as quorum sensing, might have an important role in growth initiation in *Mtb*.

TBS-EP665 Detection of first-line and second-line Drug-Resistance mediating mutations in *Mycobacterium tuberculosis* with DNA extracted with different extraction methods directly from sputum using Next-Generation Sequencing

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Mycobacterium tuberculosis complex (MTBC) is a group of highly transmissible bacterial pathogens that cause significant worldwide morbidity and mortality, particularly among HIV-infected patients. Annually, MTBC is responsible for approximately 1.3 million deaths. The emergence of multi-drug-resistant (MDR) strains within the MTBC has significantly reduced treatment options. Current methods for detecting drug resistance in MTBC can be time-consuming, often requiring up to two months to yield results.

Next-generation sequencing (NGS) has provided valuable insights into the genetic diversity of MTBC, which are crucial for understanding the evolution and transmission of the disease. NGS has also facilitated the identification of drug-resistant strains, enabling rapid and accurate tailoring of treatment. Seven genes have been used for tuberculosis (TB) first-line and second-line drug resistance analysis: rpoB (Rifampicin), katG and inhA (Isoniazid), rrs (Amikacin), rrs and eis (Capreomycin), and gyrA and gyrB (Levofloxacin, Moxifloxacin).

NGS was performed using DNA from manual extraction (FluoroLyse, Hain Lifescience) or automated extraction (GXT fleXT, Hain Lifescience and InGenius, ELITech Group) from NALC-NAOH decontaminated native sputum. Multiplex PCR targeting the seven resistance genes was employed for targeted NGS using Oxford Nanopore and Illumina technologies. Library preparation incorporated eight distinct barcodes on a single flow cell. Variant calling and annotation were performed using TB-Profiler. Concurrently, extracted DNA was analysed with FluoroType MTBDR VER 2.0 and LiquidArray MTB-XDR VER 1.0 as references. Analytical sensitivity and sequencing quality were evaluated, demonstrating promising results.

TBS-EP668 Frequency and co-resistance of bedaquiline, clofazimine, delamanid, and pretomanid in MDR-TB isolates at a North Indian reference laboratory

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Background: The emergence of multidrug-resistant (MDR-TB) and extensively drug-resistant tuberculosis (XDR-TB) has spurred use of novel and repurposed agents—bedaquiline (BDQ), clofazimine (CFZ), delamanid (DLM), and pretomanid (Pa). Primary phenotypic resistance to these drugs, however, may undermine treatment efficacy.

Objective: To determine the frequency of phenotypic resistance to BDQ, CFZ, DLM, and Pa, and to assess co-resistance patterns among MDR-TB isolates from treatment-naïve and follow-up pulmonary tuberculosis patients in North India.

Methods: A total of 70 MDR-TB isolates (55 treatment-naïve; 15 persistently culture-positive ≥4 months after treatment initiation) were tested at the Intermediate Reference Laboratory for Tuberculosis, Department of Microbiology, King George's Medical University, Lucknow, India (NABL-accredited). Liquid culture drug susceptibility testing was performed on the Becton Dickinson BACTEC MGIT 960 system using WHO-recommended critical concentrations: BDQ 1 μg/mL; CFZ 1 μg/mL; DLM 0.06 μg/mL; Pa 0.5 μg/mL (low) and 2 μg/mL (high). Proportions of resistant isolates were calculated with 95% Wilson confidence intervals (CI).

Results: Among treatment-naïve isolates, BDQ resistance was detected in 10/55 (18.2%, 95% CI 10.2–30.3%); of these, 7/10 (70.0%, 95% CI 39.7–89.2%) also exhibited CFZ resistance. Low-level Pa resistance occurred in 3/55 (5.5%, 95% CI 1.9–14.9%); no DLM resistance was observed. Two isolates (2/55; 3.6%, 95% CI 1.0–12.3%) displayed pan-resistance to BDQ, CFZ, Pa, fluoroquinolones, linezolid, and pyrazinamide.

In follow-up samples, BDQ resistance appeared in 6/15 (40.0%, 95% CI 19.8–64.3%), with CFZ co-resistance in 4/6 (66.7%, 95% CI 30.0–90.3%). Low-level Pa resistance was noted in 2/15 (13.3%, 95% CI 3.7–37.9%); no DLM or high-level Pa resistance was seen.

Conclusions: Primary phenotypic resistance to bedaquiline was detected in nearly one-fifth of treatment-naïve MDR-TB isolates and commonly accompanied by clofazimine cross-resistance. Continued surveillance and routine susceptibility testing for these new and repurposed agents are essential to optimize MDR-TB treatment regimens.

TBS-EP671 In-vitro evaluation of indigenous device - K8 Spider Enteric Capsule for Adsorption and Transfer of *MTB Bacilli* for routine diagnosis

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Background: Paucibacillary TB represents a significant diagnostic challenge, particularly in immunocompromised patients like HIV and those with extra-pulmonary disease.
K8 Spider Enteric Capsule: Biocompatible gelatin capsule (size2) filled with autoclaved highly absorbent braids of hand-spun cotton yarn (Khadi) which is smooth, non-traumatic and non–toxic. K8 spider named due to the pattern of unfurling resembling a spider web.
Intra-capsular assembly was connected with extra-capsular string (sterilised surgical silk) through tight knot passing through pinhole which will be tapped to the cheek.
In-vitro Experiment with *MTB* H37Rv strain: Concentration of 10^4 -10^7 of H37Rv strain of *MTB suspensions* were made. 0.1ml of each conc. transferred to 30ml distilled water (30-30,000 bacilli/ml). K-8 spider kept for 1 hour and transferred to 5ml PBS, kept for 30 mins. Centrifuged at 3000 rpm,15 mins; sediment was subjected to: MGIT, LJ culture and AFB smear.
Observation: Growth observed in all except 10^4 and it was confirmed as *MTB*
Inference: K-8 spider's showing adherence to *MTB* and successful release on centrifugation (300 bacilli/ml)
In-vitro Experiment with *Known MTB Positive Sputum Sample*: 3 ml of two normal saline samples adjusted to pH of 3 & 5. K-8 spider enteric capsule added and kept for 15 mins. 1 ml of *MTB* positive sputum sample (3+ grade) added into each tube and kept for 60 mins.
K-8 spider transferred to 5 ml PBS and decontaminated. Centrifuged and sediment was subjected to LJ slants, AFB smear; Blood agar for decontamination.
Observation: Capsule dissolved in 15 mins in pH-3; 25 mins in pH-5. Growth observed in both conditions.
Inference: K-8 spider found no variability in the results due to acidic pH.
Conclusion: K-8 spider enteric capsule effectively picked up mycobacteria and has the potential to be used as a sample collection/concentration method for effective diagnosis in sputum scarce children and HIV/AIDS subjects.

TBS-EP674 Breaking resource barriers: Development of portable AIMLAM for active TB diagnosis in the HIV- population

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Urine lipoarabinomannan (LAM) testing is a promising biomarker for the development of rapid tuberculosis (TB) diagnostic assays. However, due to the very low concentration of LAM in urine samples from HIV-negative individuals, its application has traditionally been limited to HIV-positive populations. Chemiluminescent immunoassays (CLIA) offer higher sensitivity but require expensive instruments, limiting their accessibility in resource-limited settings.
To address this challenge, we developed AIMLAM—a fluorescence lateral flow immunoassay (FLF) integrated with a novel Rapid Urine Processor (RUP)—designed to deliver near-CLIA sensitivity in a portable, cost-effective format.

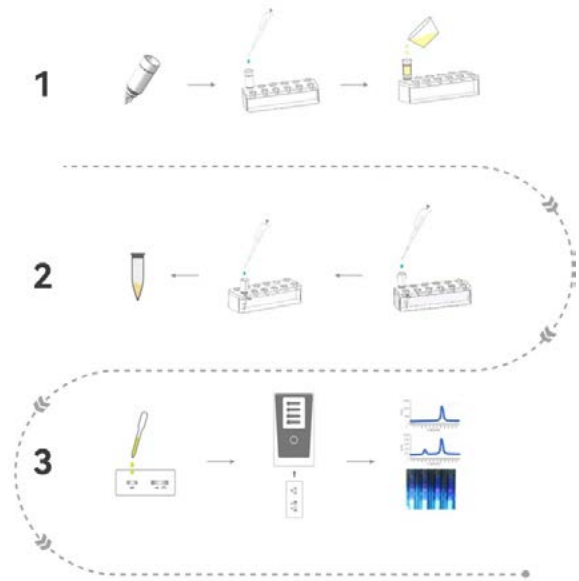

Fig 1: Operational Workflow for AIMLAM Fluorescent Lateral Flow Assay
The workflow comprises three main stages:
1. Device Preparation: Active the RUP2 device for 3 minutes, followed by a brief wash.
2. Urine Concentration: Add the urine sample to the RUP2 device and incubate for 20 minutes. Perform washing and elution steps to obtain the concentrated sample.
3. Detection: Apply the concentrated sample to the test card and incubate for 20 minutes, then test by fluorescence detector.

The AIMLAM assay involves two simple steps: urine processing using the RUP device, followed by fluorescence detection using a portable analyzer. A 6 mL urine sample is concentrated 20-fold prior to signal detection, and the

total assay time is approximately one hour. The study cohort included 77 TB patients (CRS+), 53 non-TB patients (CRS−), and 117 healthy controls. The overall sensitivity and specificity of AIMLAM were 50.6% and 94.7%, respectively. In microbiologically confirmed (MRS+) TB cases, AIMLAM achieved a sensitivity of 60.8%.
The 20× urine concentration using the RUP device significantly enhanced sensitivity without compromising specificity. The AIMLAM-FLF assay can be easily adapted for use in resource-constrained settings. Its strong diagnostic performance, ease of use, and affordability make it a promising tool for expanding access to TB diagnosis and supporting global TB control efforts.

TBS-EP677 Exhaled breath condensate: A new window on aerobiology of *Mycobacterium tuberculosis*

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Introduction: Aerosolised Mycobacterium tuberculosis (Mtb) has been detected across the tuberculosis (TB) disease spectrum and in randomly selected individuals in high-burden settings using a Respiratory Aerosol Sampling Chamber (RASC) with identification via DMN-trehalose staining and fluorescence microscopy. These findings have major epidemiological implications and require validation in other settings. This study presents a simplified exhaled breath condensate (EBC) device and assesses its potential to replicate RASC findings using an array of Mtb bacillus and host disease assays.
Method: The EBC sampler uses a copper cooling block with thermoelectric pads in which sits a glass tube for sample collection. A stainless-steel mouthpiece, secured by a 3D-printed holder, connects to a one-way valve and exit HEPA filter. This design maximises capture of the particle content of EBC and limits contamination with all participant-contact components disposable. Two patient groups were sampled with EBC pellets stained with DMN-trehalose to detect viable Mtb, and genomic detection used droplet digital PCR (ddPCR) for RD9. Supernatant samples were analysed for matrix metalloproteinases (MMP-1 and MMP-9) by DuoSet ELISA assay.
Results: Among the first TB patient group all confirmed by Xpert on sputum (n=10), 5 of 8 evaluable samples (62.5%) were positive by DMN-trehalose staining, and 4 of 10 (40%) by ddPCR. For the second group (n=15) including symptomatic (n=10: 5 Xpert+ and 5 Xpert-) and asymptomatic (n=5: Xpert-) community cases, positive LF-LAM (n=3) strongly correlated with high concentration of MMP-9 (n=3) (p=0.03). Table shows results for cases with either positive LF-LAM or high concentration MMP-9 only.

Patient	Presentation	Xpert status	EBC LF-LAM	EBC MMP-9	EBC MMP-1	Clinical Phenotype
1	Symptomatic	Positive	Positive (2+)	Detected	Not detected	Pulmonary TB case
2	Symptomatic	Negative	Positive (1+)	Detected	Not detected	Pulmonary TB case
3	Asymptomatic	Negative	Positive (1+)	Not detected	Not detected	?Subclinical TB/Mtb colonisation
4	Asymptomatic	Negative	Negative	Detected	Not detected	Alternative lung pathology

Conclusion: This pilot study demonstrates that a simple, deployable EBC device can detect viable and genomic Mtb, as well as LF-LAM and host-produced MMP-9 – critical for lung tissue destruction and granuloma formation. These findings support the feasibility of using a bespoke EBC device to study TB transmission in various epidemiological contexts.

TBS-EP680 Assessment of a simplified and portable IGRA-TB platform based on fluorescence immunoassay for the diagnosis of *Mycobacterium tuberculosis* Infection

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Objective: To evaluate whether a simplified and portable fluorescence immunoassay (FIA)-based IGRA-TB platform for the detection of interferon-gamma (IFN-γ) released in response to *Mycobacterium tuberculosis*-specific antigens can serve as an alternative to ELISA-based IGRAs, particularly in high TB burden setting such as Nigeria.
Methods: We prospectively selected two group of patients. Group 1. 50 TB disease patients with microbiologic confirmation by culture and/or PCR. These patients were included in the Asokoro Hospital (a secondary health facility in Nigeria). Tests were performed at the Zankli Research Center. Group 2. Healthy individuals (n=108), younger than 50 years old, with no signs or symptoms of active TB, and no known exposure to a pulmonary TB case. Determinations were performed at Institut

d'Investigació Germans Trias i Pujol (Badalona, Spain). For the FIA (Ichroma and AFIAS IGRA-TB; Boditech), 3 mL of blood was collected in three different stimulation tubes (nil, TB antigen, and mitogen).
After incubation of the tubes at 37°C during 16-24h, plasma was collected for assays development. IFN-γ released in the sample forms an antigen-antibody complex in the cartridge leading to fluorescence intensity signal.
Results: Among the 108 healthy individuals, 105 (97.2%) were classified as negative and 3 (2.8%) as positive across both diagnostic methods. Regarding the 50 samples collected from TB disease cases, 24 (48.0%) were positive for FI-AFIAS, 20 (40.0%) were negative, and 6 (12.0%) were indeterminate. For FI-Ichroma, 24 (48.0%) were positive, 25 (50.0%) were negative, and only 1 (2.0%) was indeterminate.
Conclusions: The FIA-based IGRA-TB platforms demonstrated high specificity and moderate sensitivity (48%) for detecting active TB. This simplified and portable system requires minimal laboratory infrastructure and hands-on time, making it suitable for point-of-care screening in decentralized settings.
These preliminary results should be consolidated in contact tracing studies to assess their performance compared with other IGRAs available.

TBS-EP683 Diagnostic Utility of Fluorescein Diacetate (FDA) Staining for Rapid Tuberculosis Detection: A Comparative Study Against Automated Liquid Culture

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Background: Rapid and reliable detection of *Mycobacterium tuberculosis* (MTB) is critical for effective tuberculosis (TB) control, especially in high-burden settings. This study evaluates the diagnostic performance of Fluorescein Diacetate (FDA) staining against the gold-standard liquid culture (LC) method.
Methods: This cross-sectional study was conducted at the Intermediate Reference Laboratory, Department of Microbiology, King George's Medical University, Lucknow, India, accredited by NABL and NTEP. A total of 109 sputum samples (>3 mL) from patients referred for TB diagnosis (n=67) or follow-up monitoring (n=42) between January–February 2025 were analyzed. All samples underwent auramine staining, automated liquid culture (MGIT 960), and FDA staining. Culture contamination cases were excluded. Diagnostic performance metrics for FDA were calculated using LC as the reference.
Results: Among diagnostic samples, 29 were auramine-positive. FDA correctly identified 16 culture-positive cases (TP), misidentified 5 culture-negative (FP), and missed 3 culture-positive (FN); 2 were true negatives (TN). In auramine-negative diagnostic samples (n=38), FDA failed to detect 3 culture-positive (FN), while 34 were TN.
Among follow-up cases, FDA accurately detected 4 culture-positive cases among 6 auramine-positive samples and 1 additional case in auramine-negative samples. Combined across all groups (excluding contaminated), FDA demonstrated:

- **True Positives (TP)**: 24
- **False Positives (FP)**: 5
- **False Negatives (FN)**: 7
- **True Negatives (TN)**: 72

From these, calculated performance values were:

- **Sensitivity**: 77.4%
- **Specificity**: 93.5%
- **Positive Predictive Value (PPV)**: 82.8%
- **Negative Predictive Value (NPV)**: 91.1%
- **Accuracy**: 88.9%

Conclusion: FDA staining offers a rapid, cost-effective alternative to culture with high specificity and acceptable sensitivity for MTB detection. Its implementation in resource-limited settings may improve timely initiation of TB treatment

TBS-EP686 Gross and histopathology of pulmonary tuberculosis in Asian elephants (*Elephas maximus*)

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Pulmonary tuberculosis caused by the *Mycobacterium tuberculosis* complex (MTC) pathogens in mammals is characterised by granulomatous reaction consisting of different types of cells like foamy macrophages, epithelioid macrophages, and Langhan's giant cells with a peripheral rim of lymphocytes and a fibrous capsule. A few granulocytes and plasma cells may also be present in these granulomas with a central core of necrosis and mineralisation.
Minor variations in the proportion of these components are recorded in the lesions caused by various species of MTC pathogens in different mammalian hosts. Most reported cases of tuberculosis in Asian elephants (*Elephas maximus*) are caused by the human strains of *Mycobacterium tuberculosis* and have shown involvement of lungs and associated lymph nodes.
This report gives a pictorial description of the important types of lesions and cells observed in the granulomas in lung nodules, collected during post-mortem examinations of six Asian elephants. Grossly, the affected lobes of lungs revealed circumscribed lesions of varying sizes with

56, 84, 112, 140 and 168 during first-line anti-TB treatment. Mycobacterial species were isolated by culture and characterised by microscopy, *rpoB*, spoligotyping, drug susceptibility testing against isoniazid (INH) and rifampicin (RIF).

One hundred and fourty-five newly diagnosed patients comprising 104 suffering from only TB and 41 co-morbid with diabetes (TBDM). Of these, 21 cases maintained viable mycobacterial [(*Mycobacterium tuberculosis*: 16 (Lineage, L 2: 2 and L4: 14), *Mycobacterium africanum* (3 (L5: 1 and L6: 2) and 2 unidentified strains)] culture at the end of day 56 of treatment. Out of these, 7 (7/41:17%) were TBDM and 14 (14/104;13%) were TB cases (p=0.432). Four of the cases' isolates were found to be resistant to INH (2 TBDM, 2 TB) at diagnosis. Isolates from 13 cases that were susceptible at diagnosis evolved to be resistant during treatment; 9 from 4 TBDM and 5 TB cases became INH resistant, 3 from TB cases became RIF resistant and 1 TB case became multidrug resistant-TB. The remaining 4 cases remained susceptible (1 TBDM) at day 56 (p=0.72).

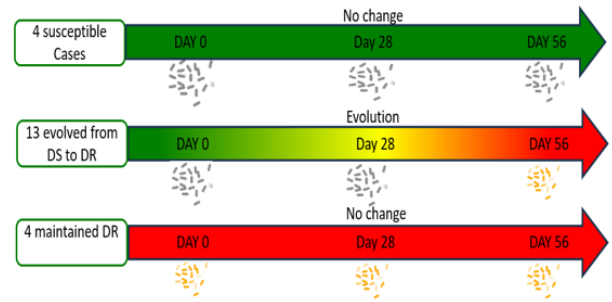

Fig 1. Evolution of drug resistance in TB patients.

We observed that drug resistance occurred on day 56 in 52.9% of the drug-resistant cases. All cases were counselled and those whose regimen needed to be changed were done according to national guidelines. Our findings highlight the need to closely monitor patients during anti-TB treatment to detect and manage drug resistant strains promptly to optimize patient care and adhere to national guidelines for regimen adjustments. The serial isolates are being sequenced to understand the underlying molecular mechanism.

TBS-EP695 Post TB morbidity - What is the optimal management of TB IRIS? Proposal for a clinical trial

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TB treatment is almost always microbiologically successful. New drugs provide expanded treatment options improving outcomes for those with drug intolerance or resistance. Challenges in delayed diagnosis and post-TB morbidity persist and contribute significantly to the burden of disease attributable to TB globally. Pulmonary impairment due to scarring is the best characterised contributor to post-TB morbidity. However immune reconstitution inflammatory syndrome (IRIS) affecting lymph nodes and lungs is also a problem.

IRIS is well-recognised in people living with HIV, however also affects those without hIV infection. It is characterised by lymph node enlargement which may be painful and may lead to skin breakdown with sinus formation, although marked clinical heterogeneity is seen. Clinical manifestations can be uncomfortable and disfiguring and can therefore cause significant distress/morbidity. The optimal management of TB IRIS is unknown.

We propose a study to investigate whether surgery may lead to improved outcomes in lymph node TB IRIS. We propose that patients with lymph node TB IRIS, occurring following successful treatment for TB are randomised to best medical therapy or surgical review. Surgical consultation may lead to operative management.

Primary outcome measures for the study will be patient reported outcome measures („PROMS") at 26 weeks post-randomisation. Secondary outcomes include change in characteristics of the lesion (size, discharge, pain scores). Outcomes will be assessed monthly (at 4, 8, 12, 16, 20 and 26 weeks).

To our knowledge this is the first randomised study to investigate treatment of TB-IRIS.

TBS-EP698 Preliminary diagnostic performance of novel LAM antibodies in CSF of HIV negative Vietnamese children with TB meningitis: A SURE substudy

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Background: Early diagnosis of tuberculous meningitis (TBM) improves outcomes however point-of-care(POC) testing is lacking. Commercialised POC testing for TB measures lipoarabinomannan (LAM) in urine. It is unknown whether LAM concentrations in CSF are below the detection limit of these assays. We determined the concentration and performance of LAM antibodies in CSF of children with TBM and non-TBM.

Methods: Nested within a randomised controlled trial of short-intensified therapy for children with TBM (SURE ISRCTN40829906), a case-control substudy was conducted at Pham Ngoc Thach Hospital and Children's Hospital 2 in Ho Chi Minh City, Vietnam. Pre-treatment CSF was tested using Ziehl Neelsen(ZN) stain, Xpert Ultra, and MGIT. Cryopreserved CSF was tested for LAM using anti-LAM capture antibodies; S4-20(FujiLAM), FIND-28, and BTM-1 covering a range of epitopes, and A194 as the detection antibody. LAM immunoassays employed a multiplexed sandwich format and electrochemiluminescence detection (U-PLEX LAM, Meso Scale Diagnostics, LLC). Performance was assessed in those with microbiologically confirmed ('definite') TBM and non-TBM.

Results: We selected samples from 20 children with definite TBM and 10 non-TBM children on this reference laboratory platform. 18/20 studied were ZN smear positive, 11 Ultra positive, and 8 culture positive. The analytical limit of detection for LAM was 24.4 pg/ml for all antibody pairs. The sensitivity and specificity of CSF S4-20 was 30% (95% CI 2-54%) and 90% (95% CI 56-99%) respectively, whereas in urine it was 65% (95% CI 41-85%) and 80% (95% CI 44-97%).

The sensitivity and specificity of CSF FIND-28 was 25% (95% CI 9-49%) and 100% (95% CI 69-100%) respectively; and for CSF BTM-1 it was 70% (95% CI 45-88%) and 70% (95% CI 35-93%).

Conclusion: S4-20 showed higher sensitivity in urine than CSF. BTM-1 had higher sensitivity in CSF which warrants further investigation as a potential point-of-care test for childhood TBM.

TBS-EP707 Ecological epidemiology insights into the risk of tuberculosis infection among captive Asian elephants

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We assessed the tuberculosis infection risk among captive Asian elephants in southern India using an ecological approach. Over a five-year-period, a total of 60 dead captive elephants were selectively included in the study. For the evaluations, a matched case-control study design with equal number of cases and controls was used.

Evaluations were conducted between 30 tuberculosis-confirmed animals and 30 disease-free animals. We examined the two potential risk factors for tuberculosis infection in elephants: the risk of transmission from diseased elephants and the risk of transmission from diseased mahouts.

Up to ten contact-elephants and ten contact-mahouts were listed for each of the 30 cases and controls. The disease statuses of the contact-elephants and contact-mahouts were determined from archived and current health records.

The individual averages, followed by the group averages of the contact positivity rates, were subsequently calculated for both the case and control groups. The group averages of the elephant and mahout contact positivity rates were then compared between the positive and negative groups.

The final prediction estimates individual probability of TB based on observed symptoms and covariates using the parameter estimates of the BLCA model.
Predicted TB probabilities for different parameter combinations ranged from 0.04% to 35.6% in training data and 0.04% to 33.4% in validation data. When evaluated against a confirmatory reference standard, the final dynamic prediction rule achieved an AUC of 0.81 on internal data and 0.79 on external validation data, and was at least 0.70 on each of the 18 different datasets. With a threshold at 0.57%, optimized for balanced accuracy, a sensitivity of 75% with a specificity of 73% in the training data and 71% in the validation data could be reached.

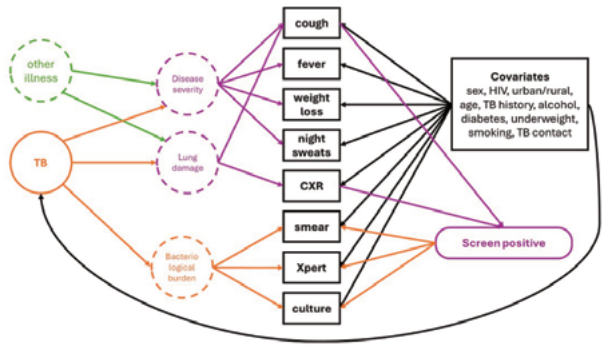

Figure 1. Schematic structure of the BLCA model for TB prediction. Squares denote observed information, circles unobserved, with TB status itself explicitly modelled and the dashed circles not modelled but used to define the dependencies between the observed tests. The presence of a screening variable for inclusion for bacteriological testing induced additional dependency. Orange arrows have impact on true TB positives only, green on the TB negatives only, while purple arrows have impact on both TB positives and negatives.

The BLCA algorithm addresses analytical challenges given the absence of a gold standard. While not recommended as a stand-alone tool for guiding treatment decisions, the model shows promise as a TB triage tool that, when combined with imaging results in an easy-to-use app format, can better identify patients who need confirmatory bacteriological testing.

TBS-EP731 The potential number of false-positive and false-negative TB diagnoses in low- and middle-income countries: A bayesian analysis of routine reporting data

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Background: Commonly-used tuberculosis diagnostics have imperfect sensitivity, and many individuals are diagnosed clinically. However, clinical diagnosis has poor sensitivity and specificity. We investigated the implications for tuberculosis diagnostic outcomes in low- and middle-income countries.
Methods: We extracted tuberculosis notifications for 2023 by country, type of diagnosis (bacteriologically-confirmed vs. clinically-diagnosed), rapid diagnostic test (RDT) use, and HIV status.
We combined these data with published evidence on sensitivity and specificity at each step of diagnosis, to assess algorithm performance and estimate total false-positive and false-negative diagnoses. We also projected the impact of achieving 100% RDT use, compared to current coverage.
Findings: We estimated results for 111 countries with 6.8 million total tuberculosis notifications in 2023. Assuming 25% tuberculosis prevalence among individuals evaluated for tuberculosis, average algorithm sensitivity and specificity were 81.3% (95% uncertainty interval: 76.7-85.3) and 89.8% (87.7-91.6) respectively.

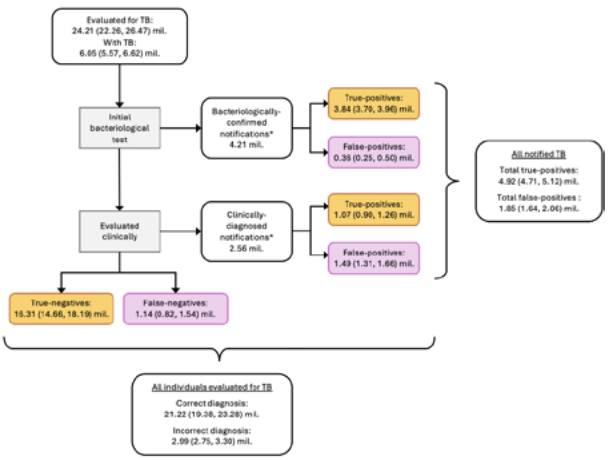
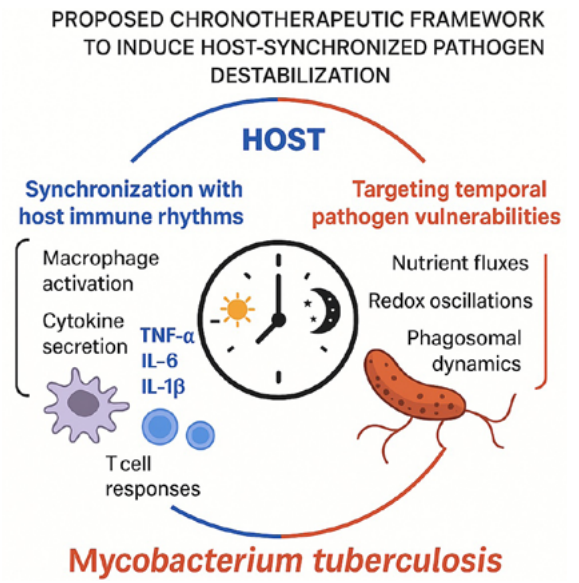


Figure. Estimated global number of individuals receiving true-positive, true negative, false-positive, and false-positive diagnoses, among individuals evaluated for TB disease in 2023.
Assumes 25% initial TB prevalence. Parentheses indicate 95% uncertainty intervals.



Conclusion: Chronotherapy introduces a time-based, host-synchronized paradigm for TB treatment. By precisely targeting circadian-aligned immune function and leveraging predictable Mtb vulnerabilities, this approach may shorten treatment duration, improve efficacy, and reduce resistance. This framework supports future chrono-HDT trials and opens a new frontier in personalized, temporal TB medicine.

Keywords: tuberculosis, chronotherapy, circadian rhythm, host-directed therapy, macrophage, Mtb metabolism, temporal immunity

TBS-EP743 Neutrophil, lymphocyte and monocyte ratios in children with active and latent tuberculosis

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Introduction: An estimated global total of 10.8 million people fell ill with tuberculosis (TB) in 2023, including 1.3 million children under 14 years of age. The neutrophil-to-lymphocyte-ratio (NLR), monocyte-to-lymphocyte-ratio (MLR) reflects essential components of the cell-mediated inflammatory response. The aim of the study was to research NLR and MLR in the blood of children with active and latent TB.

Methods: The first group included 26 children with pulmonary TB, the second group - 88 children with latent TB. The blood cell counts in children were studied before the start of treatment.

Results: Both groups didn't differ in mean age and gender. The average age of children in the first group was 5,1± 2,3 years, in the second group - 5,7± 3,4 years. The

Ultra-portable X-ray systems for reaching everyone, everywhere with TB screening

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Using AI solutions to support clinicians in making quick and accurate TB diagnosis and treatment decisions

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Using ultra-portable chest X-ray-AI screening for TB in nomadic communities of northeast Nigeria

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